AN ANALYSIS OF SCHOOL FUNDING AND STUDENT ACHIEVEMENT WITHIN THE STATE OF OHIO

An Undergraduate Distinction Project

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By

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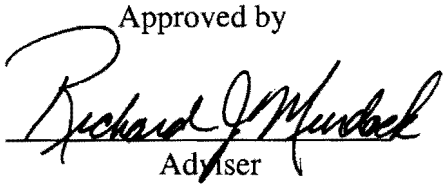

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For my mother and sister

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I. Introduction to the Problem

Background of the Problem

Seemingly everyday we read in the paper or hear in the news about how our schools are failing. In the 1980s, we were bombarded with news that we were falling behind the Japanese, and the '90s brought more of the same news, coupled with stories of hazardous school buildings, drugs, and school violence. Just recently, report cards on Ohio's schools were released, and one-third of school districts were either put on academic emergency or academic watch; only 31 of Ohio's 611 school districts were deemed "effective"[1] (Sternberg, 2000b). Not surprisingly, the question on the minds of many educators and parents is: What is wrong with America's schools?

In his book, Savage Inequalities, Jonathon Kozol gives an answer most taxpayers do not want to hear: our schools need more money. In fact, in the following passage, Kozol describes the conditions of one of the poorest schools in New Jersey, putting all that is wrong with America's schools on full display:

> The school is a two-story building, yellow brick, its windows covered with metal grates, the flag on its flagpole motionless above a lawn that has no grass. Some 650 children, 98 percent of whom are black or Latino, are enrolled here. . . .
>
> In a class in basic mathematics skills, an eighth grade student that I meet cannot add five and two. In a sixth grade classroom, brownish clumps of plaster dot the ceiling where there once were sound-absorbing tiles. An eighth grade science class is using workbooks in a laboratory without lab equipment. . . .
>
> In the principal's office, a fire inspector is waiting to discuss a recent fire. On the desk, as an exhibit, is a blackened bottle with a torn Budweiser label. The bottle is stuffed with paper that was soaked in kerosene. The inspector says that it was found inside the school. The principal sighs. He says there have been several recent fires. The fire alarm is of no use, he says, because there is a steam leak in the boiler room that sets it off. "The fire alarm has been dysfunctional," he says, "for 20 years. . . " [1991, pp. 138-140].

[1] Schools are graded according to grade 4, 6, 9, and 12 proficiency tests results, along with attendance rates and graduate rates, with a total of 27 standards to meet. An effective school district meets 26 standards, a continuous improvement school 14-25, a school on academic watch 9-13, and a school on academic emergency less than 9.

Drawing a sharp contrast, Kozol then describes two of the most affluent New Jersey schools, symbols of the potential all schools have:

> In Cherry Hill, for instance, according to a recent survey in *New Jersey Monthly* magazine, future scientists can choose from "14 offerings in the physical sciences department." There is "a greenhouse" for students interested in horticulture. "Future doctors have 18 biology electives. . . " In 1988, we read, "the school's wind ensemble traveled to the Soviet Union to perform."
>
> In a section devoted to Princeton, we are told: "Future musicians have the use of seven well-appointed 'music suites.' . . . Carpeted hallways encourage students with free periods to curl up and study in a corner. . . . Computer-equipped subject-related study halls [are] open throughout the day [and] manned by faculty. . . . Again, there is the added detail that supplies an extra touch of elegance to life at Princeton High: Three years ago, we are told, parents in Princeton raised $187,000—from outside sources—so that the choir and orchestra could travel to Vienna to perform in concert [1991, pp. 163-4].

Kozol's point is obvious: money matters. In fact, it can be the difference between going to a school with no grass on its front lawn and going to one with a greenhouse, between having no lab equipment and having 18 biology electives to choose from. While, clearly, it is not scientific to compare the very best school with the very worst school, find a difference, and then proclaim that money matters, the emotion conjured by such a strategy was not only enough to sway the opinions of the public that read Kozol's book—it also gave momentum to a movement that resulted in the Ohio Supreme Court declaring Ohio's system of school funding unconstitutional in 1997.

The fight over Ohio's school funding system has been raging for years. In 1977, Governor James A. Rhodes warned that Ohio's schools were falling apart, but, in 1979, in *Board of Education of the City of Cincinnati v. Walter*, the Court ignored this warning, deciding that Ohio's funding system was constitutional (Oplinger and Willard, 1996a). However, this decision did little to quiet critics, and, in 1991, over 530 Ohio school districts began legal proceedings in another attempt to prove Ohio's school funding

system unconstitutional. The case, *DeRolph v. State of Ohio*, was brought before Judge Linton D. Lewis in 1994 (Gray, 1998).

In this case, the plaintiff's description of Ohio's poorest schools paralleled Kozol's description of the nation's poorest schools: "The court found that in one district some students were educated in former coal bins. In another, students had no restrooms in the school building itself. In one county, 'the only library is an abandoned library truck; the band practices in the kitchen and plays in the cafeteria during lunch.' . . . Some buildings lacked running water" (Timar, 1996, p. 191). According to Judge Lewis, "This Court saw grown men and women cry as they explained the conditions and situations in which some of the youth of this state are educated"; in response, he ruled that disparities in school spending across districts shortchanged students and violated their fundamental right to education, a decision affirmed by the Ohio Supreme Court in 1997 (Timar, 1996, p. 191).

However, the debate over school funding in Ohio did not end with this ruling. The plaintiffs, like Kozol, did not offer incontrovertible evidence that money impacts a student's education. In comparing the fifty wealthiest school districts with the fifty poorest and finding significant differences in student achievement, the plaintiffs concluded that spending per pupil was the determining factor in a student's success (Timar, 1996). However, they failed to control for other factors, such as socioeconomic status, which are known to impact student performance. In fact, after controlling for socioeconomic status, many studies have found that money does <u>not</u> matter, leaving the relationship between spending per pupil and student achievement a mystery to researchers even today.

Statement of the Problem

The goal of this study is two-fold. The first goal is to determine a relationship between school spending and student performance in Ohio's schools—that is, to determine whether money alone can increase the performance of students.

The second goal of this study is to identify the variables that are associated with the highest and lowest performing school districts in the state of Ohio in an attempt to determine which factors distinguish a good school from a bad school. A sub-objective here will be to determine if the same conclusions are reached when comparing school districts as opposed to considering individual schools. Simply put, the questions I am trying to answer are the following: Does money matter, and, if not, what does?

Review of Related Literature

In my research, I will consider the impact of five groups of variables upon student achievement—spending, home background, teacher quality, school building condition, and financial efficiency.

School Spending

As stated earlier, the debate over how much school spending impacts student achievement has led to few concrete conclusions. In fact, a recent article in The Columbus Dispatch highlighted this debate by contrasting two recent studies done in Ohio that attempted to establish a relationship between school spending and achievement. The New Ohio Institute, a nonprofit organization located in Toledo, found that the average expenditure per student of Ohio school districts deemed "effective" was 17% more than the average expenditure made by Ohio school districts put on academic watch, prompting the organization's president, Andrew Benson, to conclude: "We know that

instructional spending per pupil does affect performance. It is significant" (Sternberg, 2000a, p. 1)

However, the other study, performed by the Buckeye Institute for Public Policy Solutions, based in Columbus, reached a different conclusion after looking at 38 Ohio high schools and 217 elementary schools. According to James Damask, director of research for the organization, "We've found spending, class size, higher salaries, higher advanced education of teachers—there's little evidence to show that, when applied across the board, these factors tend to improve student achievement" (Sternberg, 2000a, p. 1) So while the New Ohio Institute found a significant relationship between spending and achievement, the Buckeye Institute for Public Policy did not. That these two organizations reach different conclusions about the importance of spending to a student's achievement is not surprising. In fact, it typifies much of the research that has been performed over the past thirty years.

Trying to make sense of hundreds of such studies, economist Eric Hanushek has written several articles in which he has, in essence, summed up the results of these studies to make a conclusion about the effect of school spending. In one of his most recent publications, "Assessing the Effects of School Resources on Student Performance: An Update," he analyzes 377 such studies—with the criteria that the study have been published, that it include some measure of family background, and that it provide information about the statistical reliability of its estimates. He concludes that "[t]here is no strong or consistent relationship between school resources and student performance" (1997, p. 148).

Of course, Hanushek's work has not been received without criticism, the most substantial of which coming from Richard D. Laine, Rob Greenwald, and Larry J. Hedges in "Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes." These authors criticize Hanushek's selection of studies—many were studies completed before 1980 and come from economic, rather than education, journals—as well as his primitive way of analyzing the studies by "vote counting" rather than using meta-analysis. In reanalyzing Hanushek's data in a 1997 article, Laine, Greenwald, and Hedges found that "school resources *are* systematically related to student achievement and that these relations are large enough to be educationally important" (p. 57). Again, the conflicting results of Hanushek and Laine, Greenwald, and Hedges are not surprising. Clearly, the answer to the question of how much money matters has yet to be answered.

Home Background

Socioeconomic Status

In contrast to the effect of spending on student achievement, the effect of socioeconomic status is clear. While this effect has always been implicitly understood, its magnitude was first fully revealed in the landmark Coleman Report, issued in 1966. This large-scale study, commissioned by the federal government, found that socioeconomic status—and little else—impacted student achievement:

> [S]chools bring little influence to bear on a child's achievement that is independent of his background and general social context; and . . . this very lack of an independent effect means that the inequalities imposed on children by their home, neighborhood, and peer environment are carried along to become the inequalities with which they confront adult life at the end of school [qtd. in Rossides, 1997, p. 180].

In other words, no matter how much money is spent on children born into poverty, those children will never become high-achievers.

While some of the study itself has been found to be flawed, numerous other studies have confirmed the importance of home background: "[T]he most pervasive and widely agreed upon predictor of student achievement—the variable that absorbs nearly all explainable variation in studies of finance and outcomes is socioeconomic status" (Flanigan, Marion, and Richardson, 1997, p. 223). Common sense dictates that, facing issues such as poverty, hunger, violence, drugs, and single-parent families, students with low socioeconomic status would achieve less than their more affluent counterparts. In the words of Edgar Z. Friedenberg, what is wrong with America's schools is simply "what is wrong with America" (Boocock, 1972, p. 276). Clearly, then, we cannot expect schools by themselves to take responsibility for alleviating all of our social ills.

On the other hand, according to our common ideology, schools must be implicated to some degree in the failure of students with low socioeconomic status. According to popular beliefs in this country, anyone can make it, and an important reason why we believe this to be true is because of education—that, although we all begin with different backgrounds, school gives us a chance to better our positions, that school is, in essence, an equalizer. But the Coleman Report and the other studies that have duplicated its results contradict these basic beliefs, as they find that "education appears to have little independent power in its own right . . . [and] that education is merely a way to transmit class position from one generation to the next" (Rossides, 1997, p. 177). In general, this reproduction of class structure can be attributed to three sources—"hidden curriculum," teacher expectations, and tracking.

First, a school's "hidden curriculum" may be used to reinforce students' positions of class. This term is defined by the U.S. Commission on Civil Rights:

> . . . at Madison Junior High School, if you cooperated with the teacher and did your homework, you were a "kook." At Levi Junior High School, if you don't cooperate with the teacher and don't do your homework, you are a "kook." . . . At Madison we asked a question, "Are you going to college?" At Brighton the question always is "What college are you going to?" . . .
>
> What the pupils are learning from one another is probably just as important as what they are learning from the teachers. This is what I refer to as the hidden curriculum. It involves such things as how to think about themselves, how to think about other people, and how to get along with them. It involves such things as values, codes, and styles of behavior [qtd. in Boocock, 1972, p. 209].

In other words, students are not just learning about history or math in school, but they are also learning about their own place in society; they are being socialized. According to Daniel W. Rossides, "Many studies have shown that schools have a pronounced bias in favor of the values, norms, and skills of the upper classes and that they either overlook or discriminate against the values and skills of the lower classes" (1997, p.183). Some sociologists, like Rossides, argue that schools favor middle-class or upper-class values by using textbooks that document the history of upper-class, Western men and by hiring predominantly white, middle-class teachers. The argument behind "hidden curriculum," then, is that minorities or poor children, finding little representation of themselves in schools, often find little value in school.

Furthermore, teacher expectations for students from low socioeconomic status families may also affect achievement. Two inner-city teachers narrate some of the indifference they encounter in their fellow teachers in Savage Inequalities:

> . . . "One of these teachers comes in usually around nine-thirty. You ask her how she can expect the kids to care about their education if the teacher doesn't even come until nine-thirty. She answers you, 'It makes no difference. Kids like these aren't going anywhere'" [Kozol, 1991, p. 52].
>
> "I've got five classes—42 in each! . . . A student came in today whom I had never seen. I said, 'We'll have to wait and see if someone doesn't come so you can have a chair. She looked at me and said, 'I'm leaving.'"

> The other teachers tell her that the problem will resolve itself. "Half the students will be gone by Christmastime, they say. It's awful when you realize that the school is *counting* on the failure of one half of my class. If they didn't count on it, perhaps it wouldn't happen" [Kozol, 1991, p. 111].

While, clearly, not all teachers of poor students share this same level of indifference, many studies have found that teachers do develop lower expectations for inner-city and rural schools and for students of lower socioeconomic status, based on how they dress, how they speak, their race, etc. In fact, studies show these low expectations do affect students, creating a "self-fulfilling prophecy." Students from low-income families pick up on the clues that teachers expect little of them, so they begin to expect little of themselves as well and become low-achievers. The final result is that the existing class structure is reproduced (Ballantine, 1997).

The last way in which class structure may be reproduced is through tracking. Tracking occurs in two ways. First, tracking occurs between schools, as students usually attend schools composed of students primarily from their own economic background. As a result, students from low-income backgrounds end up attending schools where low achievement is commonplace and students from high-income backgrounds go to schools where high achievement is expected (Rossides, 1997).

In addition, within schools, tracking also takes place as socioeconomic status often determines which track students are put in (Rossides, 1997). Many studies have found that the higher a student's socioeconomic status, the more likely he or she is to be placed in an academic track. After finding that "students from manual backgrounds are over twice as likely to be placed in a vocational track," two researchers, Glenna Coclough and E.M. Beck, concluded that "[c]urriculum tracking was shown to be the critical determinant of [class] reproduction" (Ballantine, 1997, p. 65). As a result of the "hidden

curriculum," low teacher expectations, and tracking—as well as many other factors—socioeconomic status is often a key determinant of how one achieves in school.

Race

In addition to considering socioeconomic status, researchers have also studied the effect of race on achievement. In fact, most of the evidence available supports the fact that black students perform better when they attend school with white children. During the 1970s, as schools became more integrated, blacks showed academic gains at the elementary school level; and, in the 80s—the height of desegregation in America's schools—blacks made gains at all grade levels, according to data from the National Assessment of Education Program (Twohey, 1999).

However, with the resegregation that has occurred in the '90s, the achievement gap between blacks and whites is again rising. A 1996 study done by researcher Robert L. Lonin examined the relationship between segregation and student achievement in 32 states. He found that the achievement gap between blacks and whites was highest in Michigan and New York, states with high levels of segregation, and the gap was lowest in West Virginia and Iowa, states with little segregation (Twohey, 1999). While researchers disagree on what the actual impact of desegregation is, most agree it does have some impact on student achievement.

In fact, some studies have found that race may actually have more of an impact upon student achievement than poverty. Using data from school districts in Philadelphia, Douglas S. Massey and Nancy A. Denton estimated the correlation between poverty rate and percent of high school students scoring below the fifteenth percentile on the California Assessment Test (CAT), a standardized achievement test, and used this correlation to simulate, at certain poverty levels, how many students would fall below the fifteenth percentile. They found that, by raising the poverty level ten percent (from 20% to 30%), only two percent more of the students would fall below the fifteenth percentile,

whereas, given complete segregation, 11% more of the students would fall below this threshold (1993). Even more importantly, without segregation, only 35% of the students would fall below the fifteenth percentile; with complete segregation, 58% of the students would fall below this threshold. What they found, then, was that segregation had an even greater impact on student achievement than did poverty.

Many researchers have speculated as to the reason why the achievement gap between blacks and whites is heightened in segregated schools. James Coleman, in the Coleman Report, found that black students had similar aspirations to white students, but that they "felt that they had less control over their environment and left their fate to luck and chance" (Ballantine, 1997, p. 79). In addition, other studies since have duplicated this finding that, often, blacks begin with higher aspirations than whites, but that, at some point, they level these aspirations (Ballantine, 1997).

In fact, other researchers have found that at some point, as blacks lower their aspirations, they begin to reject the educational system they feel has failed them and pressure others to reject school, causing those few who are intellectually curious to get bad grades in order to fit in with their peer group. While the typical white person speaks standard English, does well in school, works hard at his or her job, and starts a traditional family, many blacks eventually reject this as their cultural norm—being black in the inner city typically means speaking Black English, failing in school, and rejecting a routine job and conventional family. To do otherwise would be to "act white," and, in hypersegregated inner cities, where typically 80% of the population is black, one does not act white without ridicule.

Researcher Signithia Fordham, in studying black students in Washington, D.C., concluded that, because of this oppositional culture, "the attempt by any individual black to achieve academic success is seen as a betrayal because it would involve eventually conforming to the norms of white behaviors and attitudes" (Singham, 1998, 11). Because

"norms that dominate a school influence what students see as possible," in segregated schools, black students often become socialized to accept norms that place little value on education (Ballantine, 1997, p.106). Segregation, then, would be expected to have a negative impact on achievement.

Teacher Quality

According to popular perception, the answer to the question of what is wrong with our schools is simply inadequate teachers. A 1998 Harris poll found that the public believed that improving teacher quality is more important than implementing stricter testing, better curricula, or smaller classes. However, it is difficult to support popular belief with research, particularly because teacher quality is so difficult to quantify (Rothstein, 1996). While, obviously, to effectively evaluate teacher quality, we would need to monitor teachers one-on-one, due to cost constraints, most studies use variables such as teacher experience or percent of teachers with advanced degrees to determine teacher quality and examine its impact on student achievement.

Teacher Experience

One of the most in-depth studies of teacher quality was done by Harvard researcher Ronald Ferguson. Analyzing 900 school districts in Texas, he divided teacher experience into two categories: teachers with five to nine years of experience and teachers with over nine years of experience. He found that both groups positively affected student achievement at a statistically significant level. For elementary school teachers, after they have taught for five years, more experience does not significantly affect student achievement, whereas high school teachers with over nine years produce better results than those with five to nine years (Kazal-Thresher, 1993). What Ferguson's study suggests is that, while teacher experience matters, its effect varies according to its

interaction with other variables, such as type of school. In fact, other researchers, including Hanushek, seem to agree that there is a positive relationship between student achievement and teacher experience (Bracey, 1997).

Teacher Education

According to researcher John Knapp, "research in the relationship between master's degrees and other college course work and measures of teaching success is rather limited" (1990, p. 29). One study Knapp does cite is a review done of 15 previous studies analyzing the relationship between teacher education and student achievement, eight of which found a statistically significant, positive relationship between teacher education and student achievement and seven of which did not. Due to the mixed results of these previous studies, in addition to his own study, Knapp concludes that graduate education tends to increase student achievement only modestly. This finding, too, is representative of other research in the area (Bracey, 1997).

Classroom Size

Although classroom size does not reflect a teacher's innate ability to teach, because it can affect the quality of his or her teaching, I will consider classroom size here as a variable reflecting teacher quality. According to Gerald W. Bracey, the debate about classroom size originated with a 1978 study done by Gene V. Glass and Mary Lee Smith. This study found that as class size decreased to 15, gains in student achievement were small, but, as class size fell below 15, the gains in achievement accelerated. Building on this study, in the early 1990s, the Tennessee legislature approved Project STAR, which, in encompassing one-third of Tennessee's school districts, has provided some of the most compelling evidence on this subject. In this experiment, students were randomly assigned to one of three groups—a regular class of 22 to 25 students, a small

class of 13 to 17 students, or a regular class with an aide for one year. The study found that those students in small classes outperformed those in regular classes in all grade levels (Bracey, 1995a).

However, it is also important to realize that school size alone does not usually impact achievement, but, rather, that it interacts with a number of other variables to have an effect on student performance. For example, while Japanese students consistently show a high level of achievement, they also have some of the largest classrooms, with over forty students per class, leading Sarane S. Boocock to conclude that "size alone is not a strong determining factor, but rather it is related to *other* factors which affect classroom productivity" (1972, p.156).

School Building

Condition of School Building

Much of the analysis done on the condition of school buildings has been descriptive. A 1996 report issued by the General Accounting Office found that Ohio's public schools were the worst-maintained in the nation, that Ohio was third worst among states in terms of the safety measures they had installed, worst in quality of electrical wiring, and second-highest in percent of schools with an asbestos threat (Oplinger and Willard, 1996a). However, although the condition of school buildings was a major factor in the ruling that Ohio's school funding system is unconstitutional, there is little research available to show the effect of poor school building conditions on student achievement.

Size of School

Research indicates that smaller schools are more likely to positively affect student achievement than larger schools. As a result of his findings, James Coleman

recommended smaller school size in his Coleman Report, and other studies done since have also found that higher interest and achievement levels are associated with smaller schools (Ballantine, 1997, p. 210). These schools—schools that are large enough to provide students with such opportunities as advanced placement classes or a variety of extracurricular activities but not so large that they allow students to get lost within the system—benefit students the most. Simply put, students are more likely to attend classes and graduate when they bond with a school—something they are more likely to do in a smaller, more intimate setting.

Financial Efficiency

As previously stated, related literature indicates that teacher experience and an advanced degree, to a lesser extent, impact student achievement; also, with more mixed results, classroom size impacts student achievement, particularly when classroom size is less than 15. Therefore, it follows that instructional expenditures—money spent on hiring teachers with more experience and more education and reducing classroom size—will increase achievement. Indeed, previous research has found that instructional expenditures, which relate directly to education, exhibit a more positive relationship with achievement than do more indirect expenditures, such as those on administration (Flanigan, Marion, and Richardson, 1997).

However, while instructional expenditures impact achievement more than other expenditures, all school districts seem to spend around the same percent of current expenditures on instruction. According to two education finance researchers, "[t]he finding that school districts spend approximately 60% of their resources on instruction is remarkably consistent across all studies that have attempted to ascertain how educational resources are allocated by school districts" (Picus and Fazal, 1996, p. 11). Another study comparing spending at both the district and school level also found that the distribution of

funds across different objects showed no significant statistical differences (Nakib, 1996). Research, then, indicates that, while instructional expenditures have a more direct relationship with student achievement than other expenditures, schools and school districts generally conform to a similar allocation pattern.

Hypotheses

This study will test the following hypotheses:

School Spending

1. After socioeconomic status, amount of poverty, and geographical area (city/suburb/rural) are controlled for, there will be a significant difference between high-spending school districts/schools and low-spending school districts/schools in terms of proficiency test results. In high-spending school districts/schools, students will have higher proficiency test results.

Home Background

2. There will be a significant difference between high-achieving and low-achieving school districts/schools in terms of poverty, defined here as percent of families receiving aid to dependent children (ADC). School districts/schools composed of students with the lowest concentration of poverty will be the high-achieving group.
3. There will be a significant difference between high-achieving and low-achieving school districts/schools in terms of socioeconomic status, defined here as family income. School districts/schools composed of students with high socioeconomic status will be the high-achieving group.
4. There will be a significant difference between high-achieving and low-achieving school districts/schools in terms of racial composition. School districts/schools in

which minorities compose a large percentage of the student population will be low-achieving, due to the effects of segregation. (This hypothesis, then, will likely not apply when considering school districts located in small towns where minorities comprise a small percentage of the student population).

Teacher Quality

5. There will be a significant difference between high-achieving and low-achieving school districts/schools in terms of teacher experience. School districts/schools with the most experienced teachers will be the high-achievers.
6. There will be no significant difference between high-achieving and low-achieving school districts/schools in terms of teacher education, as defined by the percent of teachers who have obtained a master's degree.
7. Because classroom size in Ohio is typically greater than 15, there will be no significant difference between high-achieving and low-achieving school districts/schools in terms of classroom size.

School Building

8. There will be a significant difference between high-achieving and low-achieving school districts/schools in terms of school building condition. School districts/schools with poor building conditions will be the low-achieving schools.
9. There will be a significant difference between high-achieving and low-achieving schools in terms of school size. Schools with a small or medium size will outperform those with a large school size.

Efficiency

10. There will be no significant difference between high-achieving and low-achieving school districts/schools in terms of the percent of expenditures allocated to instruction.
11. There will be no significant difference between high-achieving and low-achieving school districts/schools in terms of the percent of expenditures allocated to administration.

Significance of the Problem

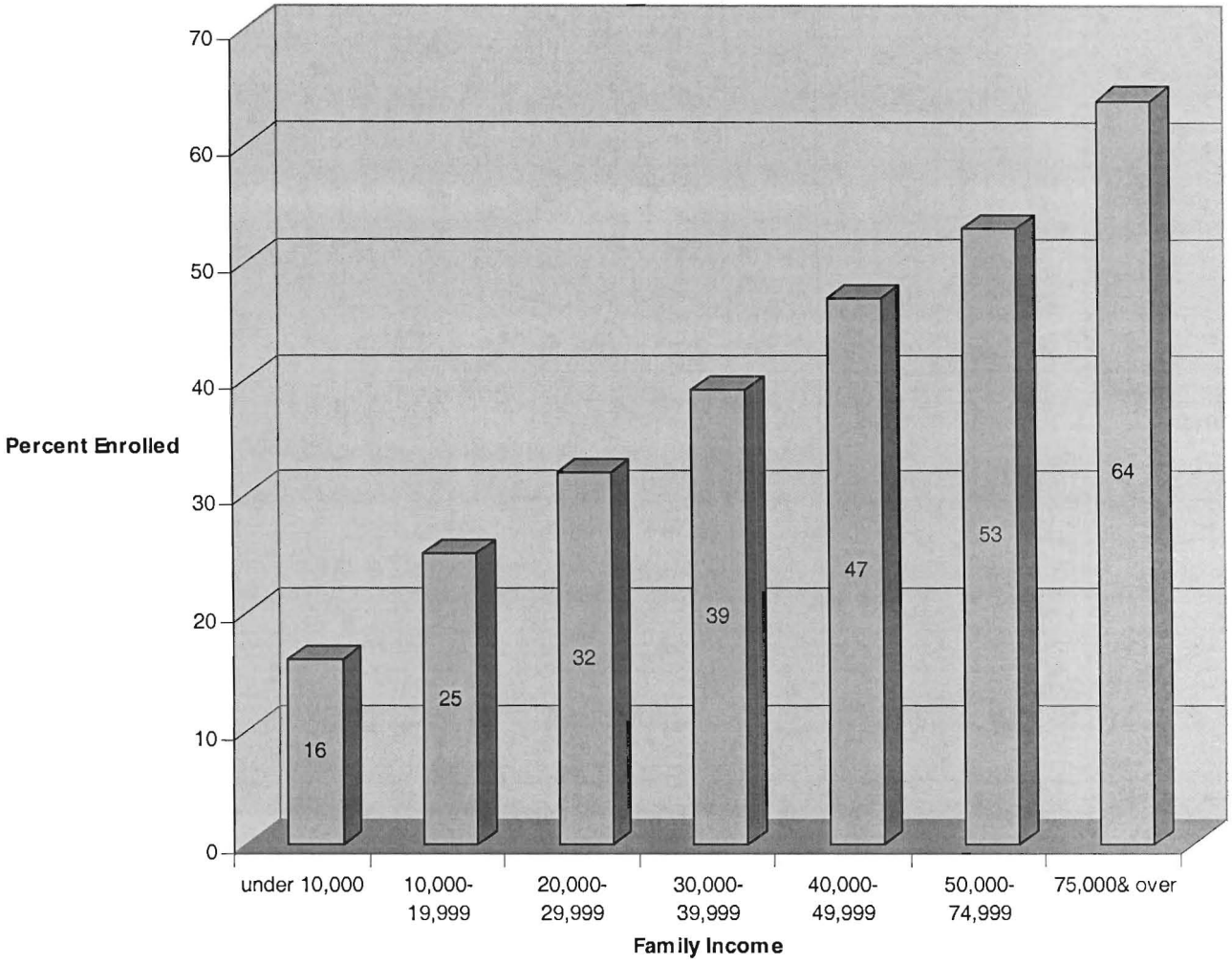
The significance of how student spending affects student achievement seems obvious. As our economy has shifted from a focus on manufacturing to a focus on service, a college degree has become increasingly important. As shown in Table 1, both men and women can double their annual earnings when they earn a bachelor's degree rather than drop out of high school. While it is apparent that college graduation is becoming increasingly important, it is also apparent who the people attending college are. As shown in Figure 1, there is a strong relationship between one's family income and his or her probability of attending college.

Table 1: Labor Market Outcomes of 25-64 Year-Olds, by Sex and Highest Educational Level Attained

Highest Educational Level	Average Annual Earnings (Male)	Average Annual Earnings (Female)
Grade 9-11	$18,194	$11,145
High school diploma	22,494	13,554
Some postsecondary	27,279	16,449
Associate's degree	31,855	19,457
Bachelor's degree	38,115	23,592

Source: U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, Reprinted in Ballantine, 1997, p. 248.

Figure 1: Families by Full-Time Enrollment of Dependent Members 18-24 Years Old by Family Income, 1993



Source: U.S. Bureau of Census, Current Population Report, Series P-20, no. 479, "School Enrollment—Social and Economic Characteristics of Students, October 1994." Reprinted in Rossides, 1997, p. 188.

This evidence, then, seems to support the fact that we are becoming two societies—the educated and uneducated, the rich and the poor.

While I hope to quantify the achievement gap in Ohio through this study, the full significance of this gap can be most eloquently expressed through a qualitative study—

through words, rather than numbers. . In the following passage from Savage Inequalities, Jonathon Kozol describes the schools of Washington, D.C.:

> There are "two worlds of Washington," the *Wall Street Journal* writes. One is Washington of "cherry blossoms, the sparkling white monuments, the magisterial buildings of government . . ., of politics and power." In the Rayburn House Office Building, the *Journal* writes, "a harpist is playing Schumann's 'Traumetei,' the bartenders are tipping the top brands of Scotch, and two huge salmons sit on mirrored platters." Just over a mile away, the other world is known as Anacostia.
>
> In an elementary school in Anacostia, a little girl in the fifth grade tells me that the first thing she would do if somebody gave money to her school would be to plant a row of flowers by the street. "Blue flowers," she says. "And I'd buy some curtains for my teacher." And she specifies again: "Blue curtains."
>
> I ask her, "Why blue curtains?"
>
> "It's like this," she says. "The school is dirty. There isn't any playground. There's a hole in the wall behind the principal's desk. What we need to do is first rebuild the school. Another color. Build a playground. Plant a lot of flowers. Paint the classrooms. Blue and white. Fix the hole in the principal's office. Buy doors for the toilet stalls in the girls' bathroom. Fix the ceiling in this room. It looks like somebody went up and peed over our heads. Make it a beautiful clean building. Make it *pretty*. Way it is, I feel ashamed." . . .
>
> Not too long ago, the basement cafeteria was flooded. Rain poured into the school and rats appeared. Someone telephoned the mayor: "You've got dead rats here in the cafeteria."
>
> The principal is an aging, slender man. He speaks of generations of black children lost to bitterness and failure. He seems worn down by sorrow and by anger at defeat. He has been principal since 1959. . . .
>
> The school is on a road that runs past several boarded buildings. Gregory [a boy at the school] tells me they are called "pipe" houses. "Go by there one day—it be vacant. Next day, they bring sofas, chairs. Day after that, you see the junkies going in." . . .
>
> A teacher sitting with us says, "At eight years old, some of the boys are running drugs and holding money for the dealers. By 28, they're going to be dead.
>
> Tunisia [the young girl mentioned at the beginning of the passage]: "It makes me sad to see black people kill black people."
>
> "Four years from now," the principal says when we sit down to talk after the close of school, "one third of the little girls in this fifth grade are going to be pregnant."
>
> I look into the faces of these children. At this moment they seem full of hope and innocence and expectation. The little girls have tiny voices and they squirm about on little chairs and lean way forward with their elbows on the table and their noses just above the table's surface and make faces at each other and seem mischievous and wise and beautiful. Two years from now, in junior high, there may be more toughness in their eyes, a look of lessened expectations and increasing cynicism. By the time they are 14, a certain rawness and vulgarity may have set in. Many will be hostile and embittered by that time. Others will coarsen, partly the result of diet, partly self-neglect and self-

> dislike. Visitors who meet such girls in elementary school feel tenderness; by junior high, they feel more pity or alarm.
>
> But today, in Anacostia, the children are young and whimsical and playful. If you hadn't worked with kids like these for 20 years, you would have no reason to feel sad. You'd think, "They have the world before them" [1991, pp. 181-183].

While years of experience have taught Kozol that these kids, in fact, have little in their future to look forward to, the question becomes: What do we do with these kids? Clearly, liberals like Kozol believe that we are all responsible for helping these kids, that we should spend money to give them a kind of school that they will not be ashamed of, to give them something beautiful apart from their lives of "drugs and death, decay and destitution" (1991, p. 87). Another advocate of this Robin Hood approach to education, in explaining why inner-city schools need more money than suburban schools, makes an analogy between schools and hospitals. Hospitals spend more money on cancer patients than those with minor problems, just like schools must spend more money on schools serving children who live in poverty because even though it will not bring those kids up to the level of more affluent kids, it will help the cause (Bracey, 1995b). While many educational researchers agree that schools serving children of poverty will need more money than schools serving children from affluent families to match their test scores, the implication of this fact is not clear.

Kozol and other liberals believe children of poverty deserve more money, but others wonder: Are these children, in fact, the equivalent of cancer patients? Can they be saved? Not surprisingly, many suburban residents believe the answer is no. They argue that a Robin Hood approach will "'bring mediocrity to every classroom in the state'"; that "[m]oney is not the answer. . . . It has to begin in the home"; that "[e]verything in a free society is not supposed to be equal"; that values, and not money, should be provided for

these children instead. They argue, in essence, that "money will not help these children" (Kozol, 1991, pp.170-1). If we look at the money we spend on our children as an investment, don't we want to put our money on the "sure thing"—the suburban child? These are the children who will become our presidents, our Supreme Court justices, our CEOs, the scientists who will discover the cure for AIDS; they are the ones we should care about the most.

The fact that there are so many different sides to this debate shows that this issue is an important problem. It is a problem that educational researchers have dealt with for over thirty years with no conclusion, prompting some in the field to call for an end to new studies to allow for a reflection on already existing studies. The question here, then, is not what is the significance of determining a relationship between money and student achievement, but what is the significance of yet another study? There are four reasons I believe my study can provide some value to already existing studies.

First, this study will provide a base of knowledge concerning Ohio's schools. While this study will certainly not end the debate about how much money matters to a student's achievement, it will, at the least, provide a descriptive analysis of Ohio's academic environment, with more attention to detail than previous studies done in Ohio.

Second, this study will attempt to make a statement on the validity of school-level data versus district-level, or aggregated, data. Because, for the most part, schools have only recently been forced to report their own data separately from the district, many past studies collected data either at the classroom level or the district level. Hanushek gives the following example of how these two different types of studies can vary: "For example, for teacher-pupil ratios, the percentage of positive and statistically significant

estimates goes from 12% to 21% and 64% as the estimates go from the classroom level to aggregation at the district and state level, respectively" (1997, p. 145). As a result, Hanushek concludes, "Simply put, analyses at higher levels of aggregation are noticeably more likely to conclude that added resources (teacher-pupil ratios or overall spending) improve student performance" (1997, p.145). In other words, aggregated, or district-level, data falsely leads researchers to find statistical relationships that may not actually exist.

However, another researcher, in her study, found that district-level data actually masked differences that exist at the school level. Unlike Hanushek, Linda Hertert was not using independent studies to make her conclusion; instead, she was using data from California but analyzing it at both the district level and school level to determine if these two different methods led her to two different conclusions. In fact, she found that, at the district level, the school funding system appeared equitable, but, at the school level, spending was less equitable (1996). In other words, while districts may all spend approximately the same amount of money on children, within districts, there is a greater variation, as different schools are spending different amounts of money on their students. My study, then, will attempt to build on Hertert's findings.

Third, this study will attempt to provide a more comprehensive look at Ohio's schools than previous studies by segregating information according to type of geographical region (city/small city/suburb). While it would be easy to take, for example, suburban and rural schools, find that suburban schools, as they spend more than rural schools, also perform better, and conclude that money does matter. However, we could also compare inner-city schools with small city schools and find that, although

inner city schools spend more than small city schools, they are nonetheless outperformed, in which case money does not seem to matter. Similarly, when examining class size, it would be easy to compare suburban schools with inner city schools, find that suburban schools, with smaller classes, outperform inner city schools, and conclude classroom size is important. However, a comparison of suburban schools with rural schools would show that rural schools have smaller classes but are nonetheless outperformed, in which case classroom size is not important. Such comparisons would likely lead researchers to dubious results. While, clearly, it is important from a public policy standpoint, to compare suburban schools with inner city schools, rural schools with suburban schools, and so forth, when these comparisons are made, geographical characteristics must be considered.

Fourth, this study will attempt to determine the effect of school building conditions on student achievements. While little research has been performed in this area, the condition of Ohio's buildings was a major factor in the court's ruling that Ohio's school funding system is unconstitutional. As a 1990 study found that Ohio's schools need $10 billion in repairs, rebuilding, and additions, clearly, we need more information on what the impact of this spending will be.

II. Methodology

Identification of Study Sample

To determine the effect of five groups of variables (spending, home background, teacher quality, school building conditions, and efficiency), I will be analyzing data at two levels—the school district level and the school level. First, at the school district level, a classification system devised by the Ohio Department of Education was used. Ohio's school districts were grouped into categories based on three dimensions: type of town (rural, small town, urban/suburban, and major city), socioeconomic status (SES) (high, moderate, or low), and poverty level (measured by % of students receiving ADC)[1]. Using this classification scheme, the Ohio Department of Education developed eight groups, described in Table 2. Of these eight groups, I will be focusing on the population of school districts in Groups 3-8 for my study, as I will omit Groups 1 and 2—the rural school districts—that fall outside my area of interest.

Table 2: District Typology

	Type of Town	**SES**	**Poverty**	**Description**
Group 1	Rural	Low	High	These districts tend to be rural districts from the Appalachian area of Ohio. As a group they have the lowest SES profiles as measured by average income levels and percent of population with some college experience.
Group 2	Rural	Low	Low	These tend to be small, very rural districts outside of Appalachia. They have a work force profile that is similar to districts in Group 1, but with much lower poverty rates.
Group 3	Small town	Not given	Moderate	These districts tend to be small economic centers in rural areas of the state outside of Appalachia. The districts tend to

[1] For a definition of rural, small town, urban/suburban, major city, ADC, etc., see Appendix B.

				contain both some agricultural and some small town economic characteristics.
Group 4	Urban	Low	Very high	These districts tend to be small or medium size "blue collar" cities with very high poverty rates. Among urban centers, they generally have the lowest SES characteristics.
Group 5	Urban	Moderate	Average	These districts tend to be both larger and have a higher SES profile than Group 4 districts. Poverty levels are average.
Group 6	Major urban	Not given	Very high	This group of districts includes all of the 6 largest core cities. It also includes large urban centers that have high concentrations of poverty.
Group 7	Urban/ Subur-ban	High	Not given	These cities typically surround major urban centers. While they often contain industrial economic activity and modest poverty levels, they are more generally characterized as upper SES communities with a highly professional/administrative population.
Group 8	Urban/ Subur-ban	Very high	Not given	These districts also surround major urban centers. They are distinguished by very high income levels, almost no poverty, and a very high proportion of its population characterized as professional/administrative.

Source: Ohio Department of Education

At the school level, K-6 schools will be studied. While the population of Groups 3-8 will be studied at the district level, a stratified sample of K-6 schools will be used at the school level, as I will be taking a sample of three strata from the population of districts. Schools from the core cities in Group 6 will be categorized as poor urban, schools from Group 5 as average urban, and schools from Groups 7 and 8 will be categorized as suburban. Groups 3 and 4, in addition to Groups 1 and 2, will be omitted from this study, because the benefit of collecting data on these groups would not outweigh the cost of sending surveys to the individual schools.

Data Collection[2]

Table 3 shows all variables on which data will be collected.

Table 3: List of Variables on Which Data Will be Collected

Variables	School District Level	School Level
Proficiency test scores	% of Ninth Graders in District Passing Ninth-Grade Proficiency Test as Ninth Graders, 1994	Percent of Sixth Graders in School Passing the Math Portion of the Proficiency Test, 1997
Spending/Pupil	District Spending/Pupil, 1985-1994	School Spending/Pupil, 1997
Home Background		
Poverty	% ADC in District, 1994	% ADC in District, 1997
SES	Average Family Income in District, 1994	Average Family Income in District, 1997
Race	% of Blacks in District, 1994	% of Blacks in School, 1997
Teacher Quality		
Teacher experience	Average years of experience of teachers in district, 1994	Average years of experience of teachers in school, 1997
% of Teachers with Master's Degrees	% of Teachers with Master's Degrees in District, 1994	% of Teachers with Master's Degrees in School, 1997
Classroom Size	Total ADM/Classroom Teacher in District, 1994	Average Classroom Size in School, 2000
School Building		
Condition of Building	Amount Needed for Repairs, Rebuilding, and Additions in District, 1990	Principal Evaluation of School, 2000
School Size	N/A	School Enrollment, 1997
Efficiency		
Amounts Spent on Instruction	Average Teacher Salary in District, 1994; Total Spent on Teachers/Total ADM, 1994	Average Teacher Salary in School, 1997; % of School Expenditures Spent on Instruction, 1997
Amounts Spent on Administration	Average Superintendent Salary in District, 1994; Total Spent on School Officials/Total ADM, 1994; Total Spent on Clerical Workers/Total ADM, 1994	% of Expenditures Spent on Administration, 1997

[2] The sources from which this data was collected are listed in Appendix A. Also, definitions of these variables are given in Appendix B.

For the school district-level data, districts were evaluated according to data from 1994. Because Ohio's school funding system was first declared inequitable in 1994, if any differences do exist between the wealthiest and poorest school districts, we should see these differences before the funding system was overhauled to equalize districts.

Also, while proficiency tests are given in the fourth, sixth, ninth, and twelfth grades, the ninth grade was chosen as the most appropriate barometer to examine how well the district had done over a prolonged period of time. While both the ninth and twelfth grade tests assess a student's achievement given this prolonged period, of the two tests, students were only required to pass the ninth grade test to graduate in 1994. As a result, these were the tests stressed most in schools, and they should serve as the best barometer for student achievement.

For the school-level data, data was collected from 1997, as that was the first year schools began reporting their data separately from the district. In light of the Ohio Supreme Court's recent finding that there has been little change in the school funding structure since the first court decision, the effect of using 1997 for data instead of 1994 should be minimal.

Also, for the school-level data, schools were evaluated according to sixth grade proficiency tests. Evaluating individual schools at the ninth or twelfth grade levels would not be appropriate because high schools cannot be held entirely accountable for a student's performance, given that students'educational experiences have been largely shaped prior to the time they reach high school. Sixth grade tests were chosen over fourth grade tests because tests taken two years further down the road should be more meaningful predictors of a student's achievement.

However, because data was not available at this time as to what percentage of students had passed all portions of the sixth grade proficiency test, performance on math tests were used instead. Of the five components of the proficiency test (citizenship, reading, writing, math, and science), citizenship and writing were excluded because, in general, students in most districts tend to do well on these tests, and, as a result, there is not as much differentiation on the scores. Also, science was excluded because it is a new section on the exam and is characterized by low passage rates across districts, again providing less differentiation in scores. While math and reading scores tend to produce the most variation, math scores were chosen because of the emphasis placed on math in both the media and the classroom over the past decade and because the content covered on the math exam is less subjective[3].

Research Design

The overall design of this study at the school district level will be that of archival research, or examining past, second-hand data—in this case, data, for the most part, collected by the Ohio Department of Education. Using the population of districts in Groups 3-8, I will rank districts in terms of the percent of students who have passed the ninth grade proficiency test. Because I am interested in finding what differentiates the best and worst schools from one another, I will take the top quintile and bottom quintile within each group to compare with one another[4]. Also, as I am taking a population within each group, there is no need to run tests on this data. Rather, I will compare each

[3] The correlation between math and reading scores is .88. As these scores are closely correlated, the effect of using math over reading should be inconsequential.

[4] Because Group 6 consists only of the major cities, and, as a result, contains only 13 school districts, a quintile would be comprised of only 2-3 districts. Therefore, I will not compare quintiles for this group.

population's characteristics, and I will use these characteristics to determine which variables are the most important.

For the school-level data, my primary method of research will also be archival. However, due to the incompleteness of the data provided by the Ohio Department of Education, I also sent a survey to the population of schools I studied. These surveys were directed to the principals of the respective schools (reproduced in Exhibit 1).

The questions in the survey were designed so that better measurements of home background, teacher quality, and school building conditions could be used. I wrote Questions 2-4 to help obtain a measure to better approximate the quality of teachers. Questions 5-8 were taken from a 1994 General Accounting Office survey; I included these questions to help approximate the amount of poverty within schools and the condition of the schools' buildings. Questions 8 and 9 were added as matters of interest concerning school curriculum and will be addressed in Chapter 4.

Of the nine questions appearing in the survey, Questions 4 and 7 were incorporated into my study of these schools. Questions 2 and 3 were excluded because many schools do not have control over which teachers are hired, as these decisions are instead made at the district level. Also, Questions 5 and 6 were excluded, as all of the children in Dayton's public schools are eligible to receive free lunches due to a special grant. Because Dayton schools comprise a relatively large percentage of the schools in this study, and because Questions 5 and 6 cannot be applied to Dayton schools, district-level data rather than survey data will be used to estimate poverty and SES[5]. Finally, Questions 8 and 9 were included as a matter of interest, rather than as a variable for

[5] Because poverty and SES economic conditions do not vary widely within a small geographical area, the effects of this approximation should be minimal.

Exhibit 1: Survey

1. Name of School
2. How many teachers applied for positions at your school last year?
3. How many applicants did you accept?
4. What is your school's average classroom size?
5. Does your school participate in the National School Lunch Program?
6. Around the first of October 1999, how many applicants in this school were approved for the National School Lunch Program? *Enter zero if none.*
7. Overall, what is the physical condition of each of the building features listed below for this school's on-site buildings? *Refer to the rating scale shown below, and circle one for EACH building feaure listed.*

Rating Scale

Excellent: new or easily restorable to "like new" condition; only minimal routine maintenance required.
Good: only routine maintenance or minor repair required.
Adequate: some preventive maintenace and/or corrective repair required.
Fair: fails to meet code or functional requirement in some cases; failure(s) are inconvenient; extensive corrective maintenance and repair required.
Poor: consistent substandard performance; failure(s) are disruptive and costly; fails most code and functional requirements; requires constant attention, renovation, or replacement. Major corrective repair or overhaul required.
Replace: non-operational or significantly substandard performance. Replacement required.

Building Feature	Excellent	Good	Adequate	Fair	Poor	Replace
Roofs	1	2	3	4	5	6
Framing, floors, foundations	1	2	3	4	5	6
Exterior walls, finishes, windows, doors	1	2	3	4	5	6
Interior finishes, trims	1	2	3	4	5	6
Heating, ventilation, air conditioning	1	2	3	4	5	6

8. What type of school is this? *Circle one.*

   REGULAR elementary
   Elementary or secondary with SPECIAL PROGRAM EMPHASIS—for example, science/math school, talented/gifted school, etc.
   SPECIAL EDUCATION—primarily serves students with disabilities
   ALTERNATIVE—offers a curriculum designed to provide alternative or nontradition education

9. How much emphasis do you place on the state proficiency tests? *Circle one.*

   Rating Scale
   1—Very Low Importance
   2—Low Importance
   3—Neutral
   4—Important
   5—Very Important

testing. For a further discussion of the questions included in this survey, please see Chapter 4.

Approximately 300 surveys were sent to schools across Ohio: 100 to the inner cities, 100 to the average cities, and 100 to the suburbs. A total of 82 surveys were returned. However, six of these surveys could not be used, as the principal did not identify the name of the school in the survey. Of these six schools, two did not identify the percent of students receiving free lunches. Two schools reported less than 35% of students received free lunches, indicating that these schools would either be average schools or suburban schools, and the other two schools, with large numbers of students on free lunches, were likely inner city schools. No indication was given on any of the surveys as to why the name of the school was not given.

Of the 76 schools whose surveys were included, 27 came from the inner city (a 27.6% response rate), 24 came from suburban schools (a 24.7% response rate), and 25 came from the average city schools (a 27.8% response rate). Although these response rates were low, this sample is still representative of Ohio schools. Of schools who responded, the average percent of students passing the math portion of the sixth grade proficiency test was 48%; the state average is 50%. Also, this demonstrates that those sixth-graders taking the test in elementary school (K-6) are representative of their peers taking the test in middle school (6-8), who were excluded from this study.

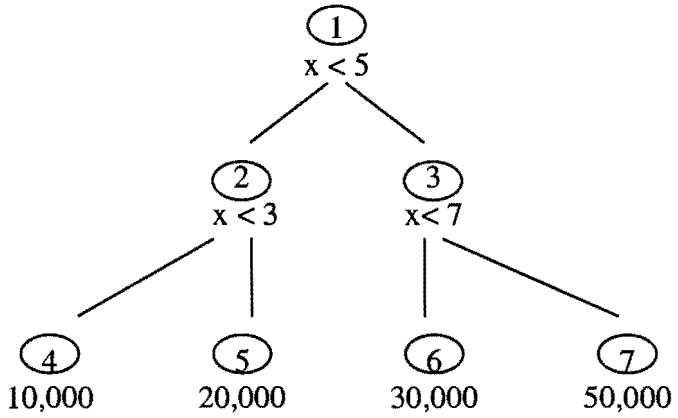
Analyses of Data

First, the district-level data will be analyzed in two ways. The first type of analysis I will use will be univariate—that is, I will look at one variable at a time. The type of univariate analysis I will use will be central tendency analysis, and I will compare

medians. Because the data compiled for this project contains extreme values, the median, or the value falling in the middle of the data, is a more appropriate measure of central location (Anderson, Sweeney, and Williams, 1990).

The second type of analysis I will use will be multivariate—that is, I will look at many variables at one time. The type of multivariate analysis I will use is a regression tree, which is similar to a decision tree. An example of a regression tree is presented below.

Regression Tree Example



Using this example, we can define several key terms. First, the points of intersection (1, 2, 3, etc.) are called *nodes*. The lines connecting the nodes are called *branches*. Nodes 4, 5, and 6 are called terminal nodes; these are the points where no other options are left (Anderson, Sweeney, and Williams, 1990).

Regression trees, like decision trees, are built on a top-down approach. We start at the top node (node 1) and then, based on whether the value of the variable is above or below the threshold value (in this example, 5), we follow a certain branch. We continue with these tests until a terminal node, containing the stored mean value, is realized (Wehenkel, 2000). So, for example, if x is less than five, we follow the left-most branch,

and then decide if x is less than three. If x is less than three, then our mean value is 10,000. Practically, regression trees, then, are easy to interpret.

Theoretically, regression trees are similar to regression models because the conditional mean (in the above example, 10,000) is the response. However, they differ from regression models because they do not require restrictive additive or multiplicative forms; as a result, they are able to describe more complex interactions. The models are fit by binary recursive partitioning—in other words, the data set we begin with is successively split into homogeneous subsets to reduce the error of the sum of squares until the set can no longer be split (Leighty, 2000). The Ohio State University Statistical Consulting Service will prepare regression trees using S-Plus statistical software.

The school-level data will be analyzed in a similar manner, as, again, medians will be compared and regression trees will be used. In addition, a response surface analysis will be performed. Response surface methodology is used when several variables affect a response of interest—in this study, student achievement—and the goal is to optimize the response. The response is a function of several variables, for example,

$$y = f(x_1,x_2) + e$$

where e equals the error. Then the surface is represented by $f(x_1,x_2)$. The goal is to optimize the surface (Dean, 2000).

There are several points to emphasize about this model. First, this model assumes that the errors are normally distributed. Also, before being entered into the model, the variables are standardized, as the mean will be subtracted from each value, and this total will be divided by the standard deviation. Finally, only the most important variables will be entered into this model to eliminate noise (Leighty, 2000). The response surface

analysis will be performed by Ohio State's Statistical Consulting Lab using the statistical software, S-Plus.

III. Presentation and Analyses of the Data

School district data

Comparison of Medians

Before analyzing the groups, I will give a brief recap of the characteristics of each group:

	Type of Town	Description
Group 3	Small town	These districts tend to be small economic centers in rural areas of the state outside of Appalachia. The districts tend to contain both some agricultural and some small town economic characteristics.
Group 4	Urban	These districts tend to be small or medium size "blue collar" cities with very high poverty rates. Among urban centers, they generally have the lowest SES characteristics.
Group 5	Urban	These districts tend to be both larger and have a higher SES profile than Group 4 districts. Poverty levels are average.
Group 6	Major urban	This group of districts includes all of the 6 largest core cities. It also includes large urban centers that have high concentrations of poverty.
Group 7	Urban/ Suburban	These cities typically surround major urban centers. While they often contain industrial economic activity and modest poverty levels, they are more generally characterized as upper SES communities with a highly professional/administrative population.
Group 8	Urban/ Suburban	These districts also surround major urban centers. They are distinguished by very high income levels, almost no poverty, and a very high proportion of its population characterized as professional/administrative.

In an attempt to differentiate between the high- and low-achieving groups, I will compare the median levels of each group concerning a number of different variables. In doing so, I will first make an intra-group comparison—that is, I will compare high- and low-achieving districts within a group and determine whether the results of each group reveal a pattern. Then, I will make an inter-group comparison—that is, I will determine whether a pattern emerges between groups.

Table 4: Median Percent of Students Who Have Passed All Parts of the Ninth Grade Proficiency Test as Ninth-Graders

	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
High Group Median	69	48	63	30	78	88
Low Group Median	55	41	44		60	75
% Difference	20.29%	14.58%	30.16%		23.08%	14.77%

The first table shown, Table 4, seen above, is descriptive; it gives a general idea of how well each group of school districts is doing[1]. Not surprisingly, the top-performing schools are from the suburban districts (Groups 7 and 8). The next best districts were comprised of students from small towns (Group 3), followed by the urban areas (Groups 4 and 5) and, finally, the major urban areas (Group 6). To help better decipher these tables, the following tables will be organized from worst to best school districts, in terms of proficiency tests, to form a continuum.

School spending

Hypothesis 1: After socioeconomic status, amount of poverty, and type of town are controlled for, there will be a significant difference between high-spending school districts and low-spending districts in terms of ninth grade achievement. In high-spending schools, students will have higher test results.

This hypothesis will be examined by looking at Table 5.

Table 5: Median Spending Per Student from 1985-1994

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$45,182	$34,403	$38,652	$34,188	$38,147	$47,241
Low Group Median		36,740	39,838	33,417	38,377	48,760
% Difference		-6.79%	-3.07%	2.26%	-0.60%	-3.22%

[1] Again, Group 6 does not have a high and low group because it contains a total of only 13 districts; instead, the number indicated with Group 6 is the median of all districts and is given only for the purpose of making inter-group comparisons.

Looking at these respective groups in isolation, we can see spending does not seem to distinguish the high performers from the low performers. In fact, in four of the five groups, the low-performing groups actually outspent the high-performing district. Making inter-group comparisons, we can see that the highest-achieving group, Group 8, has spent the most per pupil over the ten-year period from 1985-1994. However, money alone cannot explain Group 8's high achievement, as the lowest-achieving group, Group 6, spends only slightly less per pupil. Finally, between the two extremes—Groups 6 and 8—again, no pattern emerges.

There are at least four reasons that can explain why spending does not seem to matter, according to Table 5. First, according to a review of related research, it is clear that instructional expenditures have the greatest effect on achievement, but the spending measured in Table 5 is total spending, including both instructional and administrative expenditures. So Group 6, while it spends an equivalent amount of money per student as Group 8, may not spend as much as Group 8 on the instructional expenditures that impact student achievement the most. This theory will be tested later. Second, spending in each district is affected by the cost of living. Because costs are higher in metropolitan areas, a dollar spent in a major city is not worth as much as a dollar spent in a small city, where the cost of living is lower. So higher spending in inner cities does not necessarily indicate that more money is going to students, but rather that this money is being spent to keep up with a high cost of living, which does not affect student achievement.

Third, spending in each district is affected by the student population. Just as costs increase with certain areas, costs also increase with certain students—namely, disabled or

disadvantaged students. Often, because disabled students need individual tutors and disadvantaged students need food or aftercare programs, school districts populated by these students, usually inner city schools, must spend more per pupil, again with no expectation that these expenditures will improve achievement. Finally, we can conclude that these three rationalizations still do not explain the fact that there is no relationship between spending and achievement—that is, we can explain the results of Table 5 by stating that money does not matter.

Home Background

Poverty

Hypothesis 2: There will be a significant difference between high-achieving and low-achieving school districts in terms of poverty, defined as percent of families receiving ADC. School districts composed of students with the lowest concentration of poverty will be the highest-achieving groups.

This hypothesis will be examined by looking at Table 6.

Table 6: Median Percent of Students Receiving Aid to Dependent Children

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	40.08	6.32	8.15	5.20	2.16	0.69
Low Group Median		23.12	11.82	6.32	4.70	1.31
% Difference		-265.82%	-44.97%	-21.54%	-117.59%	-89.86%

Looking at these groups in isolation, we can see that the percent of families receiving aid for dependent children does distinguish the high and low performers. In all five groups, the low-performing district has a significantly higher number of families receiving aid. However, while I predicted that districts with lower numbers of ADC recipients would fare better, I did not expect to find differences when making intra-group

comparisons, as I assumed the Ohio Department of Education, through its classification system, was already controlling for poverty. That even this classification did not control for poverty demonstrates the powerful effect poverty has on educational achievement. And, comparing groups, we also see that, as expected, poverty again has an effect. While 40% of the lowest-achieving group's students receive ADC, only around 1% of the highest-achieving group's students receive this aid.

Socioeconomic status

Hypothesis 3: There will be a significant difference between high-achieving and low-achieving school districts in terms of family income. School districts composed of students with high family income will be the high-achieving group.

This hypothesis will be examined by looking at Table 7.

Table 7: Median Family Income

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$25,120	$28,308	$28,951	$29,022	$38,147	$47,241
Low Group Median		24,797	26,760	28,308	33,941	50,671
% Difference		12.40%	7.57%	2.46%	11.03%	-7.26%

Expecting that family income will follow a similar trend as ADC, I was surprised to see that, while, in four of the five groups, higher income is associated with higher performance, the differences are not nearly as pronounced as they were for ADC. However, it is important to note that, while one of these variables measures income, the other measures wealth, and the difference between these two measures can be extreme. Consider, for example, the fact that middle-class blacks earn 70 cents for every dollar earned by middle-class whites, but, in terms of wealth, they own only 15 cents for every dollar owned by middle-class whites (Oliver and Shapiro, 1997). In other words, when

comparing middle-class blacks with middle-class whites in terms of income reveals little inequality, but comparing them in terms of wealth reveals profound differences. Many researchers argue that inequality is often best expressed in terms of wealth, or the accumulation of money over a period of time, rather than income, which measures only one year. Therefore, we would expect ADC to capture more of the disparity between the two groups. However, making inter-group comparisons, we can still note a definite trend. Income seems to rise with proficiency test scores, as the median student's family income in Group 8 is almost double of the median student's family income in Group 6.

Race

Hypothesis 4: There will be a significant difference between high-achieving and low-achieving school districts in terms of racial composition. School districts in which minorities comprise a large proportion of the student population will be low-achieving, due to the effects of segregation.

This hypothesis will be examined by looking at Table 8.

Table 8: Median Percent of Black Students

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	42.1	2.6	2.3	N/A	0.5	0.8
Low Group Median		4.7	23.6	N/A	2	1.8
% Difference		-80.77%	-926.09%		-300.00%	-125.00%

An intra-group comparison shows that, as expected, in all four groups[2], the low-performing groups had a larger proportion of blacks. This effect is most dramatic in Group 5, where the median percent of blacks in the high-achieving school districts is only

[2] Small towns were omitted here because blacks comprise such a small proportion of the populations in small towns. Although the median number of blacks in suburbs shown here is also low, because some suburbs do have a significant number of blacks—for example, in Shaker Heights, a district included in Group 8, almost half the population is black—suburbs were included here.

2.3%, compared with 23.6% in the low-achieving school districts. However, because the argument here is not that blacks are intellectually inferior, but rather that the effect of segregation on blacks is negative, a more effective comparison occurs when making comparisons between groups with segregation and those without. In fact, an inter-group comparison also shows that, while blacks comprise only 1-2% of the high-performing Group 8 districts, they comprise more than 40% of the low-performing Group 6 districts.

Teacher Quality

Teacher experience

Hypothesis 5: There will be a significant difference between high-achieving and low-achieving school districts in terms of teacher experience. School districts with the most experienced teachers will be the high-achievers.

This hypothesis will be examined by looking at Table 9.

Table 9: Median Teacher Experience

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	15.3	15.8	16.0	15.9	14.9	15.3
Low Group Median		15.7	14.9	15.3	15.3	14.0
% Difference		0.63%	6.88%	3.77%	-2.68%	8.50%

Here, an inter-group comparison would seem to support Hypothesis 5, given that, in four of the five groups, the high-performing groups had the more experienced teachers. However, these differences were minimal, with the biggest difference showing up in Group 8, where experience differs by less than 9%. In addition, an inter-group comparison does not show any pattern, as the median teacher experience in the lowest-achieving group is the same as the highest-achieving group. Still, while this hypothesis is not supported, it is important to realize that in many school districts, with a certain

amount of experience, teachers gain the right to choose which school in a district they would like to teach at. So, at the school level, we see the best schools employing the most experienced teachers, but, at the district level, we see these differences being masked (Guthrie, 1996). Therefore, a school-level analysis may be more revealing here.

Advanced Education

Hypothesis 6: There will be no significant difference between high-achieving and low-achieving school districts in terms of teacher education, as defined by the percent of teachers who have obtained a master's degree.

This hypothesis will be examined by looking at Table 10.

Table 10: Median Percent of Teachers with Master's Degrees

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	43.8	39.3	43.1	46.0	49.7	57.2
Low Group Median		38.2	50.0	39.5	47.8	51.7
% Difference		2.80%	-16.01%	14.13%	3.82%	9.62%

As with teacher quality, an intra-group comparison here might be misleading. Although, in four of the five groups, high-achieving groups were characterized by a high percent of teachers with master's degrees, the largest differential appears in Group 5, where the low-achieving group has a significantly higher number of teachers with master's degrees than the high-achieving group does. However, disregarding Group 6, in general, an inter-group comparison reveals that the percent of teachers with master's degrees increases along with proficiency test results. The fact that these results indicate, for the most part, that teachers' master's degrees have some effect—but not an

overwhelming effect—is reflective of previous research that shows advanced education having only a modestly positive effect on student achievement.

Classroom Size

Hypothesis 7: Because classroom size in Ohio is typically greater than 15, there will be no significant difference between high-achieving and low-achieving school districts in terms of classroom size.

This hypothesis will be examined by looking at Table 11.

Table 11: Median Class Size

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	16.7	19.0	19.1	18.9	19.4	17.1
Low Group Median		18.3	17.8	19.2	19.0	17.1
% Difference		3.84%	6.55%	-1.59%	2.06%	0.00%

Again, looking at the groups in isolation, we see that four of the five groups show a similar pattern, but the fact that the high-achieving group and low-achieving group never differ by more than 7% indicates that, as predicted, class size is not much of a factor. However, what is surprising is that, in these four cases, the higher-achieving districts actually have a larger class size than the low-achieving districts. When making an inter-group comparison, we see no pattern between the districts, as the second-highest achieving districts in Group 7 have the largest class sizes. However, it is important to note that these results do not necessarily reflect the fact that classroom size does not matter, but rather that gains in student achievement are difficult to detect when class size is above 15.

Nevertheless, because Table 11 indicates little effect of class size on student achievement, these results help to explain why the low-achieving districts were

previously found to be spending more than high-achieving districts without improved results. These districts are spending money to hire additional teachers and reduce class size, although low class sizes by themselves do not appear to increase achievement.

School Building Characteristics

Hypothesis 8: There will be a significant difference between high-achieving and low-achieving school districts in terms of school building condition. School districts with poor building conditions will be the low-achieving schools.

This hypothesis will be examined by looking at Tables 12 and 13.

Table 12: Median Repairs and Rebuilding Needed

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$5232	$3571	$4184	$4159	$3592	$5026
Low Group Median		6505	4360	4086	3541	4214
% Difference		-82.16%	-4.21%	1.76%	1.42%	16.16%

Making intra-group comparisons gives mixed results; in three of the groups, the low-achieving group needs more repairs and rebuilding, but, in the other two groups, the high-achieving group needs more work. An inter-group comparison provides even more surprising results, as Group 8, the high-achieving group, needs the second-most repairs and rebuilding. These results, then, are contradictory to the court's finding that, because of inequity in school funding, some districts have been able to construct elaborate schools in which students would be able to maximize their achievement and gain an unfair advantage over students attending school in dilapidated buildings. However, while the court based its decision on its assessment of schools in rural areas, it is important to note that those areas were excluded in this study. Obviously, if those areas had been taken into account here, a different finding may have been reached.

In addition, these surprising results can be explained in a number of ways. First, school building conditions may have little effect on student achievement. Second, we can question the validity of the appraisals that were made. While the architectural firms selected to make the appraisals were more than qualified—of 477 firms vying to do the work, only nine were selected—the actual appraisal method itself can be questioned. While construction costs in different areas vary according to the cost of living, standard costs were applied for each type of repair needed; for example, if a school in Appalachia and a school in an inner city both needed the same type of repair, their assessed repairs would be the same value, according to the study, when, in reality, the school in the inner city will have to pay more for the repair. Also, the uniformity of the appraisals can be questioned, as appraisals are always subjective in nature.

In addition, these results consider only the condition of the building, and not the environment in which the building is placed. Obviously, there is a difference between attending a school in an abandoned city, surrounded by crime, and between attending a school in a small town or suburb, surrounded by picturesque settings and beautiful houses. Finally, these results cannot fully paint a picture of the conditions of Ohio's schools because the appraisals are made concerning future actions that need to be taken and do not reflect the money that has already been put into the schools. For example, a school built thirty years ago may need the same amount of repairs, at the current point in time, as a school built seventy years ago, but we would still not consider these buildings to be equivalent, because clearly the thirty-year-old building will be the most modern or state-of-the-art.

Table 13: Median Additions Needed

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$707	$1189	$751	$815	$691	$178
Low Group Median		751	189	731	647	481
% Difference		36.84%	74.83%	10.31%	6.37%	-170.22%

In addition to Table 12, Table 13, presented above, can be used to examine the condition of buildings across the state of Ohio. Looking at differences within groups, we can see that, in four of the five groups, the high-achieving group requires more additions than the low-achieving group. Because the required amount of additions indicate current overcrowding, these results are not surprising, given that parents will want to move their children out of the low-achieving districts to give them a better chance at succeeding in school; because districts may not have been built originally to house this kind of demand, we see these districts being overcrowded.

However, this logic does not translate to an inter-group comparison. First, when making an inter-group comparison, we should recognize Group 6 as an extreme situation. This group, consisting of inner-city schools, needs few additions because, with "white flight," or the movement over the last few decades from the inner cities to the suburbs, schools built seventy years ago are often too big for the low populations they now serve. So, disregarding this group, we can see a trend moving from Group 4 to Group 8, that, with increased proficiency test results, the effect of overcrowding decreases, the exact opposite of what we saw before within each group. Whereas before we saw overcrowding in the high-achieving districts within each group, now, when we look between groups, we see the most overcrowding in the low-achieving groups.

This trend can be accounted for if we consider class mobility. Within each group, class is relatively homogeneous, so it is not as big of a hardship for a parent to buy an equivalent-priced house in a different district with similar economic characteristics but higher achievement. Therefore, within groups, we see the most overcrowding in the high-achieving districts, as they try to meet higher demand. However, buying a house in a Group 4 school district is a much different proposition than buying one in a Group 8 district; simply put, there is not as much mobility between groups as there is within groups. Because it is so difficult to be able to afford a house in a high-achieving Group 8 school district, as expected, we see there is little overcrowding within this group. Although most parents would probably love to move their kids to Group 8 districts, most cannot afford to do so, and as they are kept out of the more affluent districts, these districts avoid overcrowding. Clearly, while mobility explains movement within groups to the high-achieving districts, it does not explain movement between groups; therefore, overcrowding is seen in the high-achieving school when making intra-group comparisons and not when maker inter-group comparisons.

Efficiency

Instruction

Hypothesis 10: There will be no significant difference between high-achieving and low-achieving school districts/schools in terms of the percent of expenditures allocated to instruction.

This hypothesis will be evaluated by considering teacher salary and total spent on teachers, presented in Tables 14 and 15, respectively.

Table 14: Median Teacher Salary

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$37,218	$34,355	$38,153	$33,308	$38,912	$43,497
Low Group Median		33,718	37,091	33,051	37,946	42,183
% Difference		1.85%	2.78%	0.77%	2.48%	3.02%

First, looking at the differences between the high-achieving and low-achieving groups in Table 14, we can see that, in all five groups, teachers in the high-achieving groups are paid more, but that the differences between the groups is also minimal in all groups, with a high difference of only 3%. And, while making an inter-group comparison, we can see that Group 8, the highest-achieving group, clearly attracts the best teachers in paying almost $5,000 more in salary than any other group. Overall, though, an inter-group comparison provides mixed results, as the groups' median teacher salaries show no pattern as we move from the low achievers to the high achievers.

Although the overall finding is that median teacher salary varies very little, and that there is no obvious pattern between teacher salary and student achievement, it is important to note here that teacher salaries are largely determined by the geography of the schools and the labor wage rate in that particular area. Again, because cost of living in small towns is low, we would expect that Group 3 would pay teachers the lowest rate. So a more interesting comparison here occurs between similar geographical regions. Between Groups 4 and 5, both average cities, Group 5 pays teachers higher rates and produces better results. And between Groups 7 and 8, Group 8 pays higher rates and produces the best results, indicating that teacher salary does have some impact on student achievement.

Some of these same patterns are seen in Table 15, seen below, which examines amount spent on teachers per student, taking into account not only teacher salary but the number of teachers in each district. As with Table 14, an intra-group comparison of districts in Table 15 shows that in all five cases, more is spent per teacher in the high-achieving groups than the low-achieving groups, but that in all cases these differences are minimal. And an inter-group comparison again reveals no pattern, except that Group 8 far outpaces the rest of the schools.

However, if, as before, we compare similar groups, we see that in Groups 4 and 5, both consisting of average city districts, Group 5 produces better results with more spending on teachers, and that, between the two suburban groups, Groups 7 and 8, Group 8 produces better results by spending more on teachers. So while varying labor rates make detecting patterns between the groups difficult as a whole, by comparing similar groups, we again see that spending more money on teachers does make a modest, but not significant, difference.

Table 15: Median Total Spent Per Student on Teachers

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$629	$585	$716	$571	$699	$822
Low Group Median		569	686	562	653	817
% Difference		2.74%	4.19%	1.58%	6.58%	0.61%

Administration

Hypothesis 11: There will be no significant difference between high-achieving and low-achieving school districts/schools in terms of the percent of expenditures allocated to administration.

This hypothesis will be examined by looking at median superintendent salary, median total spent per student on school officials, and median total spent per student on clerical workers; these three variables are presented in Tables 16, 17, and 18, respectively.

Table 16: Median Superintendent Salary

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$90,452	$62,600	$73,318	$62,740	$73,335	$81,128
Low Group Median		65,510	79,467	61,685	72,847	82,185
% Difference		-4.65%	-8.39%	1.68%	0.67%	-1.30%

First, an intra-group comparison of the districts in Table 16 gives mixed results; in two of the groups, the high-achieving districts pay superintendents higher salaries; in the other three groups, the low-achieving districts pay more for superintendents. An inter-group comparison also reveals no definitive relationship between superintendent pay and student achievement, as Group 6, the lowest-achieving group, pays the most for superintendents. The information, then, confirms what we already know—that superintendents, like all other school officials, are not paid for performance, but rather that salary reflects local wage rates. However, it is important to note that this finding does not diminish the importance of an effective superintendent, but rather this finding indicates that superintendent effectiveness and superintendent pay are not related.

Table 17: Median Total Spent Per Student on School Officials

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$294	$137	$275	$225	$250	$306
Low Group Median		157	309	237	249	266
% Difference		-14.60%	-12.36%	-5.33%	0.40%	13.07%

Next, looking at Table 17, we can examine the effect of the total spent per student on all school officials. First, an intra-group comparison duplicates our findings from Table 16. In three of the groups, the low-achieving districts spend more on officials; and, in the other two groups, the high-achieving districts spend more. Also, an inter-group comparison reveals no clear pattern. The total spent on officials by Group 6, the lowest-achieving group, is comparable to that spent by Group 8, the highest-achieving group, and no pattern emerges between these two extremes.

However, there are two other important items to note from Table 17. First, looking at the percentage differences within the groups, we note a definite trend as we follow the continuum from Group 4 to Group 8. Following this continuum, we see that high-achieving districts spend proportionately more on school officials, so that the high-achieving districts in Group 8 spend more on officials, relative to the low-achieving districts, than any other group. In addition, comparing Group 4 with Group 8, we see that Group 8 spends more than twice as much per student on officials than Group 4; clearly this difference cannot be entirely explained by differences in cost of living.

This trend can lead to two distinctly different conclusions. First, we could conclude that spending more money on officials is an inefficient allocation of resources, and because the highest-achieving groups spend the most on officials, clearly efficiency is unrelated to achievement. On the other hand, we could conclude that officials are the ones who run the schools, so having talented officials is important and reduces inefficiencies in other areas. Further research is needed in this area to make a valid conclusion here.

Table 18: Median Total Spent Per Student on Clerical Workers

	Group 6	Group 4	Group 5	Group 3	Group 7	Group 8
High Group Median	$241	$137	$183	$113	$155	$197
Low Group Median		156	188	127	160	180
% Difference		-13.87%	-2.73%	-12.39%	-3.23%	8.63%

Finally, Table 18 gives us an indication of how much schools are spending on clerical workers, another measure of efficiency. Noticing trends within groups, we can see that, in four out of the five groups, the low-achieving districts spent more on clerical workers, with two of these differences being substantial. This finding indicates that inefficient allocations of resources in the low-achieving districts is costing them, in terms of student achievement.

However, an inter-group comparison does not duplicate this finding, as there is a wide variation between groups, with no clear pattern emerging. One explanation of the contradictory findings is the fact that the amount of clerical workers hired is related to the student population the districts serve. For example, Groups 6 and Group 8 outpace the other groups in terms of spending. Often, Group 6 districts must hire additional clerical workers to help administer the special programs they provide for the large number of disadvantaged students they serve. On the other extreme, because Group 8 runs special programs for its talented children, it must also hire additional workers. Another explanation would be due to cost of living. Because districts within each group are comparable in terms of their cost of living indexes, it is easier to establish patterns making intra-group comparisons than when comparing groups that vary widely in their costs of living.

Regression Trees

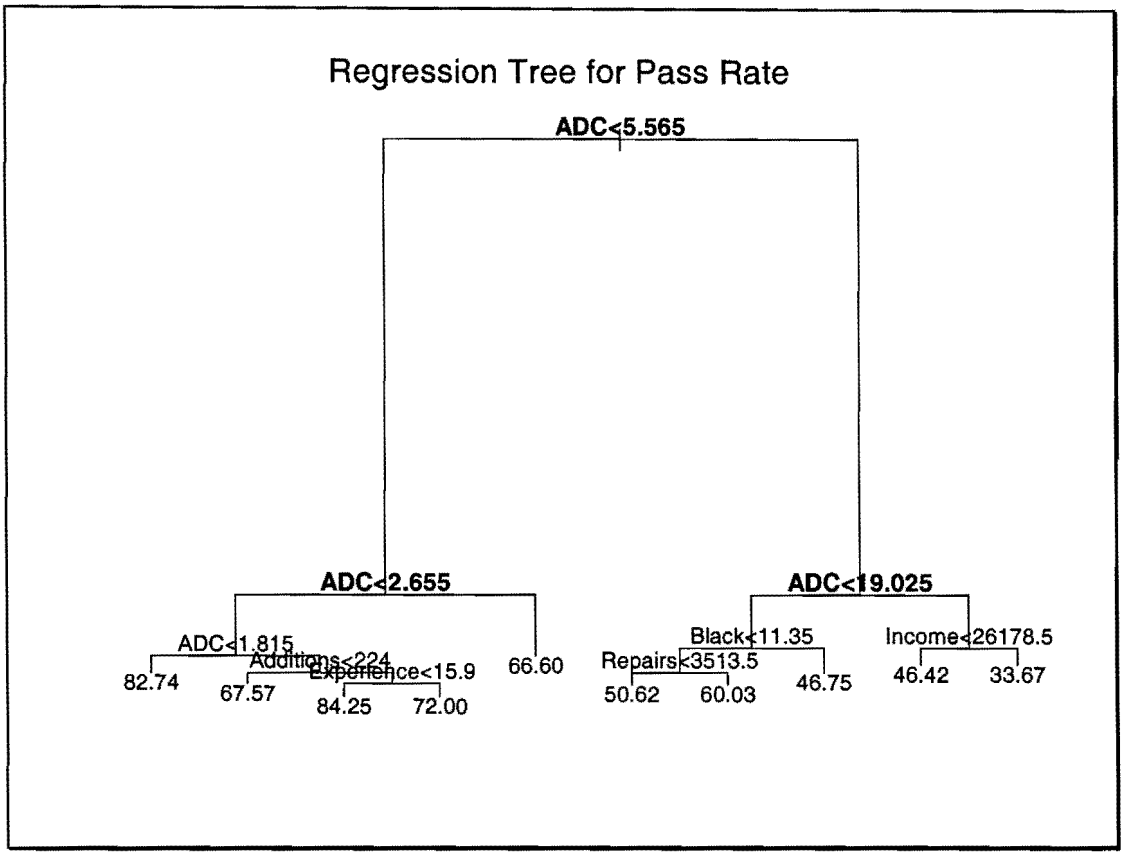
In addition to analyzing the districts by comparing medians, I will also consider two regression trees. The first regression tree, presented in Figure 2 below, tells us two things: first, which variables are most important and, second, the effect of these variables. First, the variables of the most importance appear as the first decisions we must make as we follow the branches of the tree. As we can see in Figure 2, the first decision we must make concerns the percent of students receiving ADC; this means that ADC explains the most variation in test scores. Again, demonstrating the effect of ADC, regardless of which node we follow next—that is, whether ADC is less than or greater than 5.565%[3]—the second decision we must make also concerns ADC. Finally, for the low ADC group, the third decision we make is also about ADC; for the high group, the third decision concerns either the percent of students who are black or family income. Clearly, Figure 2 is telling us that the variables that matter the most all relate to home background, with the percent of students receiving ADC explaining the most variation in test scores.

Second, Figure 2 explains how variables such as ADC or income affect achievement. The first decision we make is whether the proportion of students receiving ADC is less than or greater than 5.565%. If the percent of students receiving ADC is less than 5.565%, then 74.7%[4] of the students will pass the test; if it is greater than 5.565%, only 51.2% will pass. Assuming we follow the low ADC branch, the second decision we

[3] This percent is chosen by the S-Plus software as the cutoff point at which the two clusters of high-achieving and low-achieving school districts tend to separate from each other.

[4] This percent, and other percents discussed in this text, were generated from a print-out concerning the regression tree and do not appear in Figure 2. For the sake of simplicity, the only percents given in Figure 2 are those appearing at the terminal nodes.

Figure 2



will make is whether ADC is less than or greater than 2.655%. If the proportion is less than 2.655%, then 79.0% of the students will pass; if it is greater than 2.655%, only 66.6% will pass. Likewise, if we follow the high ADC node, our second decision will concern ADC. If the proportion of students receiving ADC is less than 19.025, then 55.4% of the students will pass; if it is greater than 19.025, only 43.9% pass. Overall, examining the tree from left to right—from lowest poverty to highest poverty—we see proficiency passage rates drop from 84.3% to 33.7%. Clearly, then, we can see test scores drop as the percent of students receiving ADC increases. As expected, poverty has a negative effect on student performance.

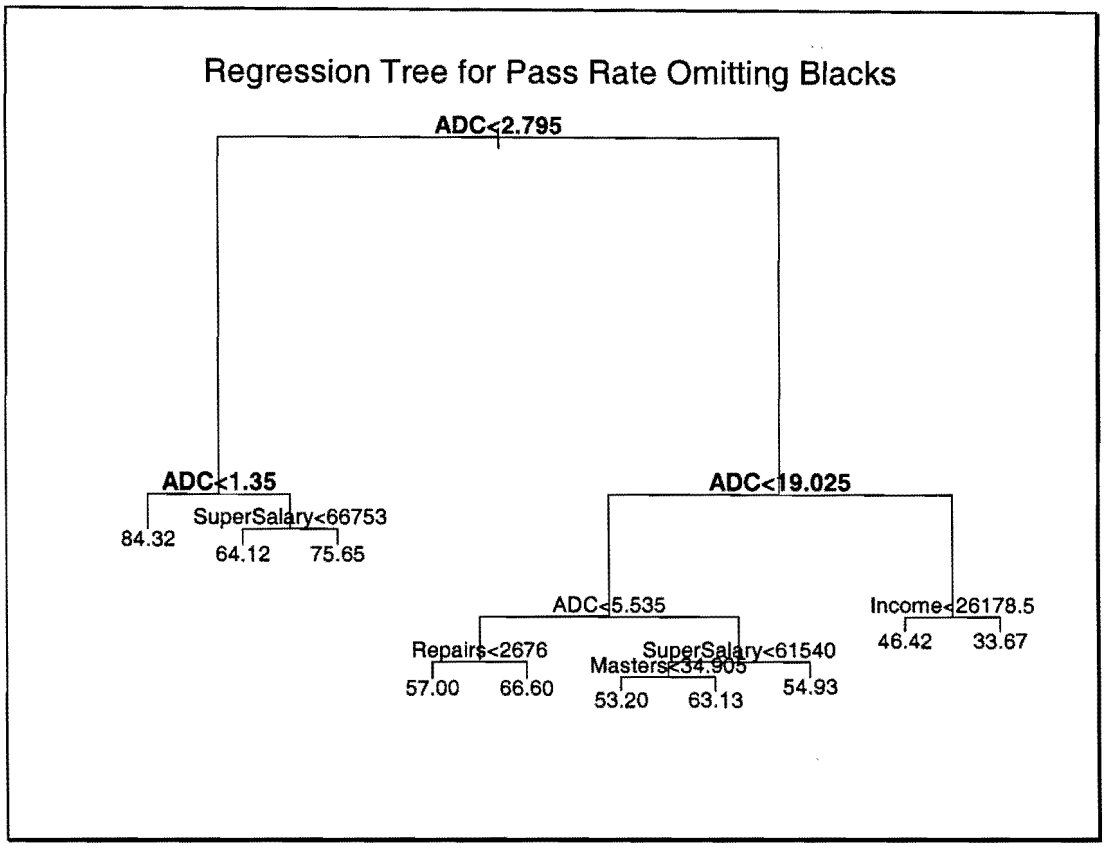
The second-most important variables affecting student achievement will be examined next. One of these variables is the percent of students who are black If this

percent of students who are black is less than 11.35%, then 58.1% of students will pass the test; if it is greater than 11.35%, only 46.8% will pass. Again, as expected, segregation has a negative effect on black students' performance.

However, what we find when examining income is unexpected. If income is less than $26,179, then 46.4% of the students pass; but, if income is higher, only 33.7% of the students pass. Income, then, has a negative effect on achievement, contrary to what we have seen before. However, it is important to note here that before we have reached this node, most of the variation in test scores has already been explained. In fact, the number of districts ending up at the terminal node of 33.67% represents only six districts, or 3.7% of the population. This surprising result, then, is not real, but rather it is the result of noise after the variation of most test scores has already been explained.

Next, because the percent of blacks in a district is highly correlated with the number of students receiving ADC, the regression tree in Figure 3, seen below, explains variation in test scores, omitting the effects of segregation. Again, this tree can be used to determine which variables matter and what the effect of these variables is. First, we can see that, again, the first decision we must make concerns ADC—ADC is the variable that once again explains most of the variation. And, regardless of whether ADC is low or high, the second decision we must make also concerns ADC. Finally, if ADC is high, the third decision also concerns home background—either ADC again or income. However, if ADC is low, the third decision concerns a new variable—superintendent salary.

Figure 3



However, clearly, the most important variables are again related to home background.

Second, in addition to explaining which variables matter most, Figure 3 explains how these variables affect achievement. Again, the effect of poverty on achievement is negative. If ADC is below 2.795%, then 77.5% of students in the district pass the ninth grade proficiency test as ninth graders; however, if ADC is above 2.795%, only 57.58% of students pass. The same patterns that we saw in Figure 2, we see again in this figure, except that the percent of blacks has been omitted as a variable. Again, income appears to have a negative effect on achievement until we realize that, at this level in the tree, there is little variation in scores left to explain, and only six schools are represented in the terminal node with a 33.67% passage rate. Finally, while, in the tree, the effect of superintendent salary appears logical—superintendent salary increases with test scores—

at this point in the tree, as with income, most of the variation has been explained. Clearly, both regression trees demonstrate that home background is the most important factor in determining student achievement and that, as poverty increases, achievement decreases.

School Data

Comparison of Medians

First, to develop a general sense of the school-level data, as with the district-level data, I will compare medians. Because each group only contains approximately 25 schools, the top and bottom quintiles of each group would comprise only four or five schools; therefore, as with the Group 6 district-level data, the median will be taken using all schools in each of the three groups. As a result, there will be no intra-group comparisons between high- and low-achieving schools, but rather only inter-group comparisons will be made. This information, concerning all variables, is presented in Table 17 below.

Proficiency Test Results

Table 17 shows that, as expected, the inner cities produced the worst test scores, the average cities produced average test scores, and the suburbs produced the best test scores. As these tables are read from left to right, then, a continuum is formed, from lowest-achieving schools to highest-achieving schools. This continuum will be helpful when analyzing the other variables.

Table 19: Medians Related to School-Level Data

	Inner City Group	Average City Group	Suburban Group
Percent of Sixth Graders Passing Sixth Grade Proficiency Test	17.8	54.3	69.4
Spending	$5753	$5377	$5132
% ADC (District)	41.8	10.2	1.6
Average Income (District)	$26,098	$28,487	$41,721
% Black	56.2	4.7	0.8
Teacher Experience	14.7	14.7	14.7
Percent of Teachers with Master's Degree	48.6	41.4	46.4
Class Size	23	22	23
Building Condition	2.8	2.5	2.2
% of Current Expenditures Spent on Building Operations	19.1	17.0	17.0
School Size	460	415	621
% of Current Expenditures Spent on Instruction	61.4	67.3	66.9
Teacher Salary	$37,642	$40,170	$42,417
% of Current Expenditures Spent on Administration	6.7	5.9	6.4

Spending

Hypothesis 1, predicting that the highest-achieving students will spend the most per pupil, will be examined by looking at Table 19. In fact, Table 19 provides evidence contrary to expectations developed from Hypothesis 1—that is, the table presents a clear relationship between spending and achievement, but the low-achieving schools outspend the high-achieving schools. This confirms findings at the district level and can be explained by the four factors mentioned earlier—that total expenditures differ from instructional expenditures, which are more closely tied to achievement, that there is a

higher cost of living in inner cities, that there are higher costs associated with disadvantaged or disabled students, and that money alone may not be the answer.

Home Background

Poverty

Poverty will be the first home background variable examined. Hypothesis 2, predicting that the lowest-achieving schools will have the greatest concentration of poverty, can be examined through the data presented in Table 19. This data confirms expectations developed from Hypothesis 2. The lowest-achieving inner city schools have four times the poverty, measured in terms of ADC, as average cities and 26 times the poverty of schools in the suburbs. Obviously, poverty has a negative effect on achievement.

Socioeconomic Status

The next variable, average income, was predicted in Hypothesis 3 to have a positive effect on achievement. Table 19 confirms this relationship; as income increases, so do test scores. Average city students' family income is 8% larger than inner city students' is, and suburban schools' family income is 60% greater. While again the effects of income are not as dramatic as the effects of poverty, clearly, family income has a positive effect on achievement.

Race

The last home background variable that will be examined is race. Table 19 confirms expectations developed in Hypothesis 4 that segregation will have a negative effect on black students' achievement. The inner cities, with the largest percent of blacks, have the lowest achievement. They have 12 times the number of blacks in

average city schools and 70 times the number of blacks in suburban schools. As expected, as the percentage of blacks increases, the percent of those passing the proficiency tests decreases, due to the effect of segregation.

Teacher Quality

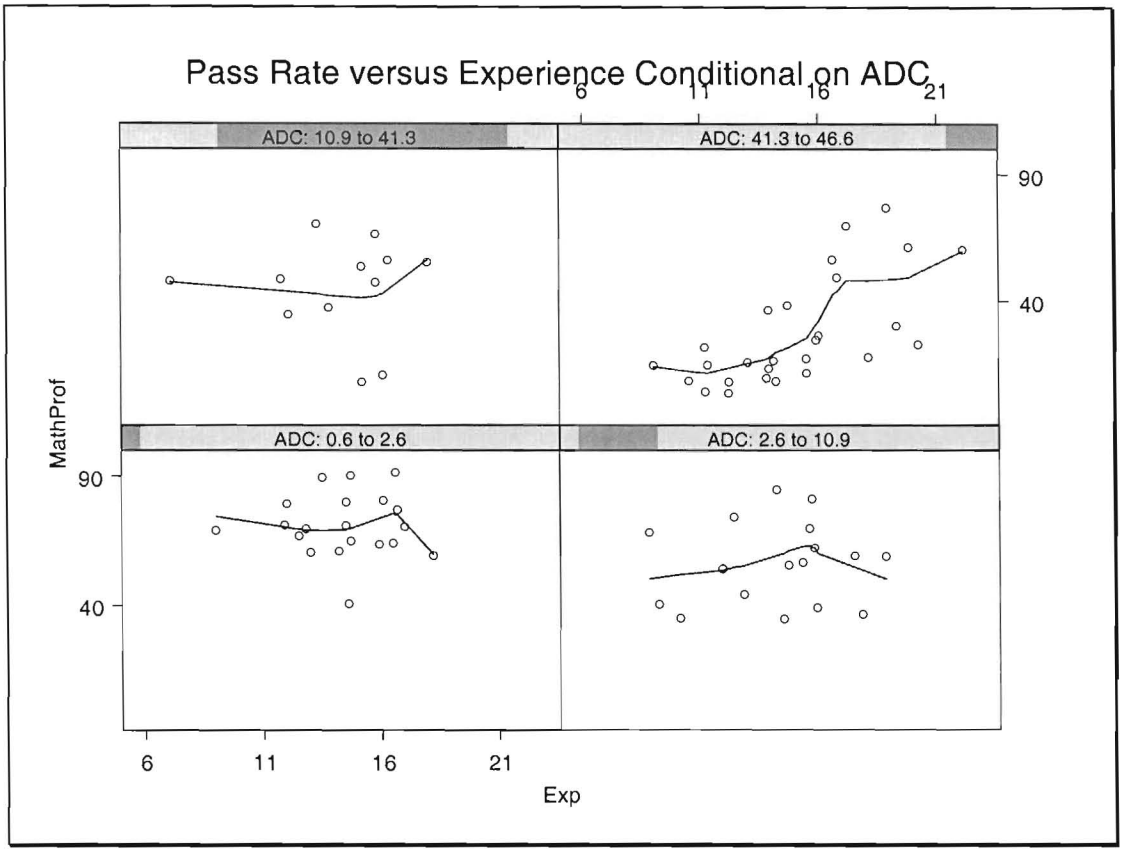
Teacher Experience

The first teacher quality variable that I will consider is teacher experience. Hypothesis 5, which predicted that achievement would increase with teacher experience, is analyzed through data summarized in Table 19. Looking at this table, we can see that the relationship between experience and achievement is clear—there is no relationship. In all groups, the median teacher has 14.7 years of experience. While this confirms my findings in the district-level analysis, I had predicted that differences in teacher experience masked within the districts would be revealed in a school-level analysis. Clearly, this is not the case.

However, it is important to note that a comparison of medians is a measure of central tendency and does not consider the distribution of values, which, in this case, turns out to be more revealing. Figure 4 is a plot of teacher experience versus achievement, conditioned on ADC—that is, Figure 4 determines a relationship between teacher experience and achievement in each of the four quartiles of ADC. Looking at the first three quartiles where ADC is below 41.3%, again we see no clear relationship between experience and achievement. Looking at quartile 4 (where ADC is between 41.3% and 46.6%), though, for the first time, we see a clear relationship—as teacher experience increases, so do test scores. Teacher experience, then, seems to matter only when ADC is high, indicating that more teacher experience does not cause test scores to

rise, but rather that teachers with more experience gain more rights to gravitate to the higher-achieving

Figure 4



schools, leaving the worst schools with the least-experienced teachers. This idea will be explored further when the regression trees for the school-level data are analyzed.

Percent of Teachers with Master's Degrees

The second teacher quality variable I will examine is advanced education, or percent of teachers with master's degrees. Hypothesis 6, predicting no significant differences between the high- and low-achieving schools in terms of achievement, will be analyzed by looking at Table 19. In fact, this data provides mixed results. The low-achieving schools in the inner cities actually hire the most educated teachers, followed by the high-achieving suburban schools, then the average cities. While the district-level

analysis provided mixed results, it, for the most part, seemed to indicate that the greatest concentration of master's degrees was located within the high-achieving districts. However, these results are not confirmed in the school-level analysis. That these two analyses do not agree is not surprising, considering the mixed results of previous research, which has failed to provide a definitive answer as to whether teachers' education impacts student achievement.

Class Size

The last teacher quality I will examine is class size. In Hypothesis 7, I predicted that there would be no significant differences between the high- and low-achieving schools in terms of class size. The data that will be used to analyze this hypothesis is also included in Table 19. This data is similar to that regarding teacher experience, as all of these schools are very comparable[5]. Again, this data confirms the findings on the district level that lower class size cannot be used to distinguish the high- and low-achieving schools. Only if one of these groups were to hire additional teachers and reduce class size by 7-8 students would we be likely to see dramatic improvements in student achievement.

School Buildings

Condition of Building

The first variable examined related to the school will be principals' evaluations of the condition of their school buildings. Principals were asked to rate several features of their buildings (e.g., roofs, foundations, heating) on a scale of 1-6, with 1 representing excellent, or "like new," and 6 representing that replacement was needed. The rating of

[5] The numbers presented here for class size are higher than those for the district-level data because special education teachers were not included at the district level.

all of these factors was averaged, and this overall rating is presented in Table 19. Hypothesis 8, predicting that the high-achieving schools will have the best building conditions, will be examined through this data. In fact, the data shows that most principals rated their schools between 2 and 3, with 2 representing good conditions—that only routine maintenance is required—and 3 representing adequate conditions—that some corrective repair was needed. Although most principals evaluate their schools as being between good and adequate, a clear trend emerges from Table 19, as principals in suburban schools rate their schools as being closer to good and principals in urban schools rate their schools as being closer to adequate. This finding, then, supports the expectations developed in the hypothesis.

However, this finding at the school-level contradicts the finding at the district-level, where there were mixed results. This may be due to the fact that, as noted in the district-level analysis, the appraisals made in the 1990 study did not take into account the difference in the age of the buildings, so a thirty-year-old school that needed a new furnace would be equivalent, in terms of the data, to a seventy-year-old school that needed a furnace, whereas, at the school level, a principal would rate the thirty-year-old school as being in better condition. Considering this fact, the school-level data would be superior to the district-level data. On the other hand, the district-level data was based on the evaluation of professional architects, while the school-level data was based on the evaluation of principals, who are experts on matters of education rather than appraisals. Further research would be needed here to determine whether the district-level data or school-level data is giving the most accurate depiction of the condition of the school buildings.

Percent of Expenditures Spent on Building Operations

The second variable concerned with school buildings will be percent of expenditures allocated to building operations, or building maintenance. Again, Hypothesis 8 predicted that the highest-achieving schools would have the best building conditions. The data presented in Table 19 shows that the average cities and suburbs used the same percent of expenditures on building operations. However, the inner city schools spent approximately 12% more of their expenditures on buildings operations. This fact is a confirmation of the previous finding that these buildings require more maintenance.

School Size

The last variable concerned with school buildings is school size. Hypothesis 9 suggests that average or small school sizes will be related to the highest test scores. However, the data presented in Table 19 does not support this hypothesis. The highest-achieving group, the suburban group, has the schools with the largest student populations, with 25% more students than the average city and inner city schools. While this hypothesis is not supported in this study, it is important to note that most discussion of school sizes relates to high schools, where extracurricular activities, in particular, can be important in allowing the student to bond with the school and increase his or her likelihood of graduating.

Efficiency

Instruction

The first variable considered related to efficiency is percent of total expenditures allocated to instruction. Hypothesis 10, predicting no differences between high- and low-

achieving districts in terms of money spent on instruction, will be examined by looking at the data in Table 19. This data shows that the lowest-achieving group in the inner cities devotes about 9% less of its expenditures on instruction. While this difference is not dramatic, it does indicate that inner city schools may be able to increase achievement if they allocate a similar percentage of expenditures to instruction as the other two groups.

Teacher Salary

The next efficiency variable is teacher salary, which makes up a large percentage of the amount spent on instruction. Again, Hypothesis 10 is applicable, and again this hypothesis will be examined using data in Table 19. Unlike the data for instruction, this data shows a clear relationship between teacher salary and achievement—achievement increases with teacher salary. In addition, this finding confirms the finding in the district-level analysis that the high-achieving schools recruit the best teachers with higher salaries.

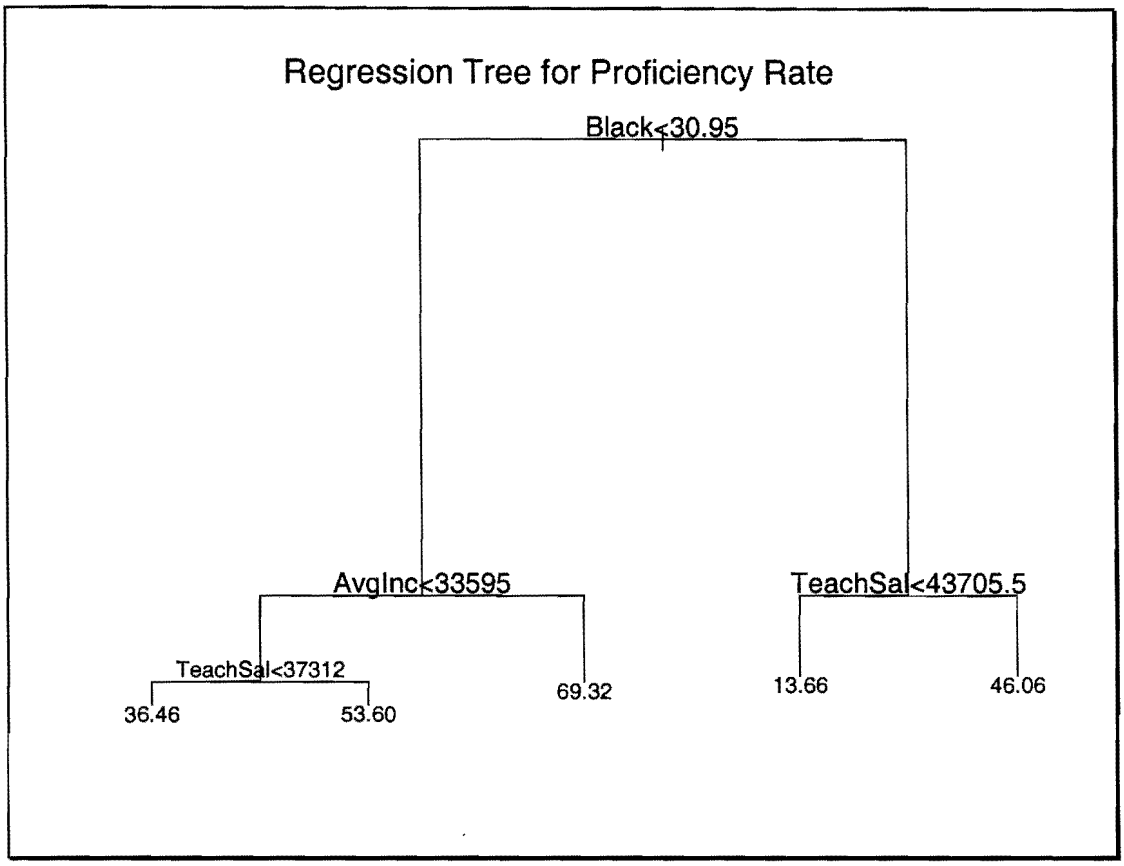
Administration

The last variable is the percent of expenditures allocated to administration. According to Hypothesis 11, there will be no difference between the high- and low-achieving schools in terms of how much they spend on administration. The data in Table 19 supports this hypothesis, as there is no clear relationship between achievement and percent of expenditures allocated to administration. However, this data does show that the lowest-achieving schools in the inner city allocate the most resources to administration. While the suburban group allocates a similar percent to administration with no adverse effect on achievement, clearly, critics of inner city schools can point out

that, if some of these inefficiencies were reduced, the money could be better spent on instruction.

Regression Trees

Figure 5



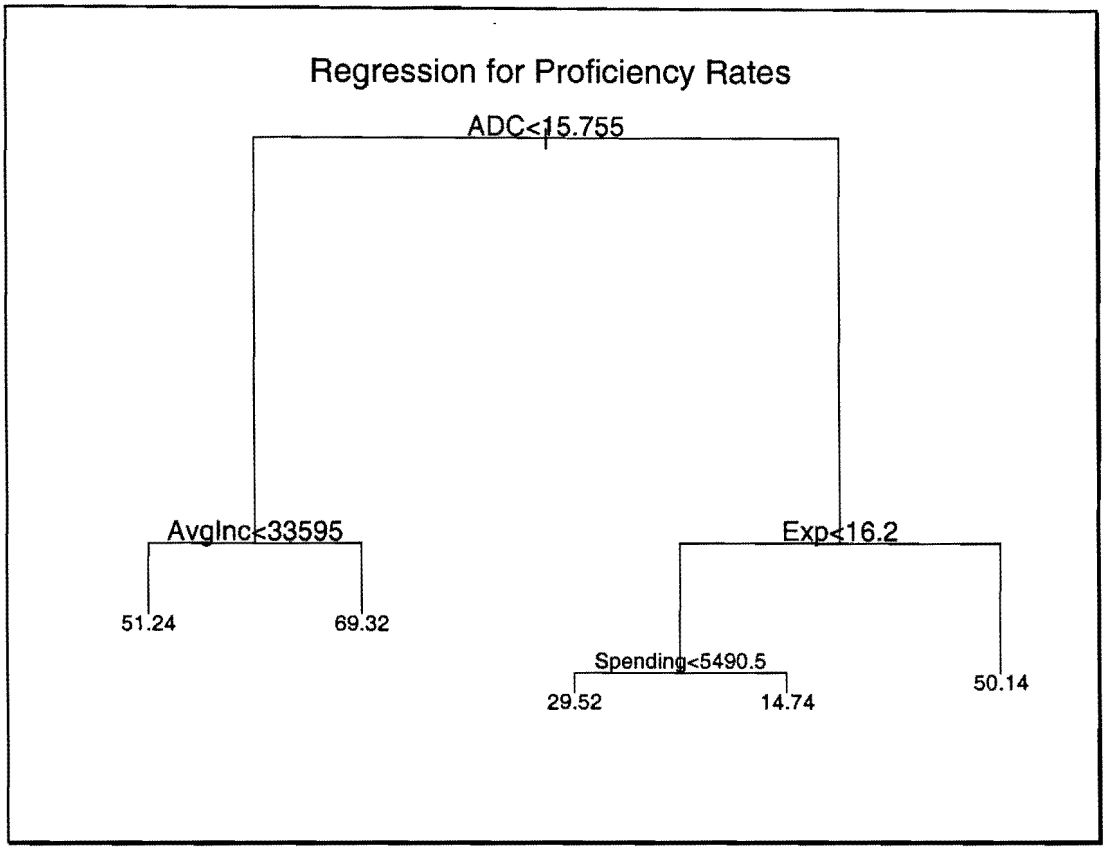
As with the district-level data, regression trees were performed for the school-level data. However, to reduce the noise in the trees, these trees were extended to only five terminal nodes, rather than the 10 included in the district-level data. Again, the first regression tree, presented in Figure 5, can tell us two things: first, which variables matter and, second, what the effect of these variables is. Interestingly, with the school data, ADC does not appear in this regression tree at all. Instead, the most important variable is the percent of students who are black; this variable explains the most variation in test

scores. While few school districts, as a whole, contain a population of blacks that exceeds even 50%, many individual schools within that district may contain populations of blacks that exceed 90%. Therefore, at the district level, we see ADC as the most important variable, whereas, at the school level, we see race as the most important variable. And, once the percent of blacks explains the variation in test scores, there is not much left for ADC to explain. For students with lower percentages of blacks, not surprisingly, income becomes the next deciding factor; for schools with higher percentages of blacks, a new variable becomes important—teacher salary. Still, as we have seen repeatedly, home background variables account for most of the variation in test scores.

In addition to telling us which variables are important, Figure 5 tells us what the effect of these variables is. First, the effect of segregation is negative. If the percent of blacks in a school is less than 30.95%, 60.1% of the students will pass the math portion of the sixth-grade proficiency test; if the percent is greater than 30.95%, only 20.1% will pass. Next, if the percent of blacks is low, average income must be considered. Again, as income increases, so do test scores.

As with the school district-level data, a regression tree was also composed omitting blacks as a variable, due to the high correlation between being black and receiving aid. This regression tree is shown in Figure 6. Similar to what we saw in the district-level data, the variable that explains the most variation in test scores is ADC. And, if ADC is low, not surprisingly, income is the next most important variable. However, if ADC is high, teacher experience and spending become important variables. Figure 6, then, tells us that, again, home background is the most important variable in

Figure 6



explaining student achievement, but that other variables, including teacher experience and spending, also explain some of this variation.

Next, I will consider the effect of these variables. While some of the variation in poverty has been eliminated because I am using district level, rather than school level, ADC, clearly, poverty still has a negative effect on achievement. In, schools with high ADC and low teacher experience, only 18.7% percent of students pass the math portion of the sixth-grade proficiency test. However, if poverty is high and teacher experience is high, 50.1% of students pass, a percent comparable with those with low ADC and low average income (51.2%). However, here, it is important to note that few schools have high ADC and more experienced teachers, and even fewer schools have low ADC and low income. A more relevant comparison, when considering the impact of ADC, is made

between the high poverty schools with low experience who pass only 18.7% of students, and those schools with low poverty rates and high income, who pass 69.3% of students. Obviously, this is a great discrepancy.

The second-most important variables are average income and teacher experience. First, income will be considered. If average income is greater than $33,595, 69.3% of students pass the sixth grade proficiency test, but if it income is lower, only 51.2% pass. In this analysis, the effect of income is in line with expectations, as test results increase with income. Second, we must consider teacher experience, as it appears in the regression trees for the first time. If average teacher experience is below 16.2 years, only 18.7% of students pass, but if teacher experience is above 16.2 years of experience, 50.1% of students pass. This finding confirms what we saw in Figure 4, again illustrating the effect of teachers with tenure abandoning the poorest schools. Finally, the third decision we make concerns spending. As we have seen, the worst schools must spend the most on their students to bring scores up; therefore, it is no surprise that the lowest-achieving schools are spending the most.

Response Surface Analysis

Finally, a response surface analysis can tell us how well the three most important variables—race, poverty, and socioeconomic status—explain variation in test scores. The response surface analysis, in this case, yields three observations. First, as seen in Table 20 below, the linear effect of the variables, rather than the quadratic or crossproduct effect, dominates the response surface, so each variable can be seen as independent. Second, Table 20 also gives an R-square of .7048 for the total model. This means that if, instead of predicting the points in the data using the mean, we were to

predict the points using this linear model, we would see a 70% reduction in the prediction error. This model, then, is very useful for predicting points.

Table 20: Response Surface Analysis-I

Regression	DF	Type I Sum of Squares	R-Square	F Value	Pr > F
Linear	3	85.833161	0.6873	51.21	< .0001
Quadratic	3	0.497332	0.0040	0.30	0.8276
Crossproduct	3	1.689422	0.0135	1.01	0.3949
Total Model	9	88.019916	0.7048	17.51	< .0001

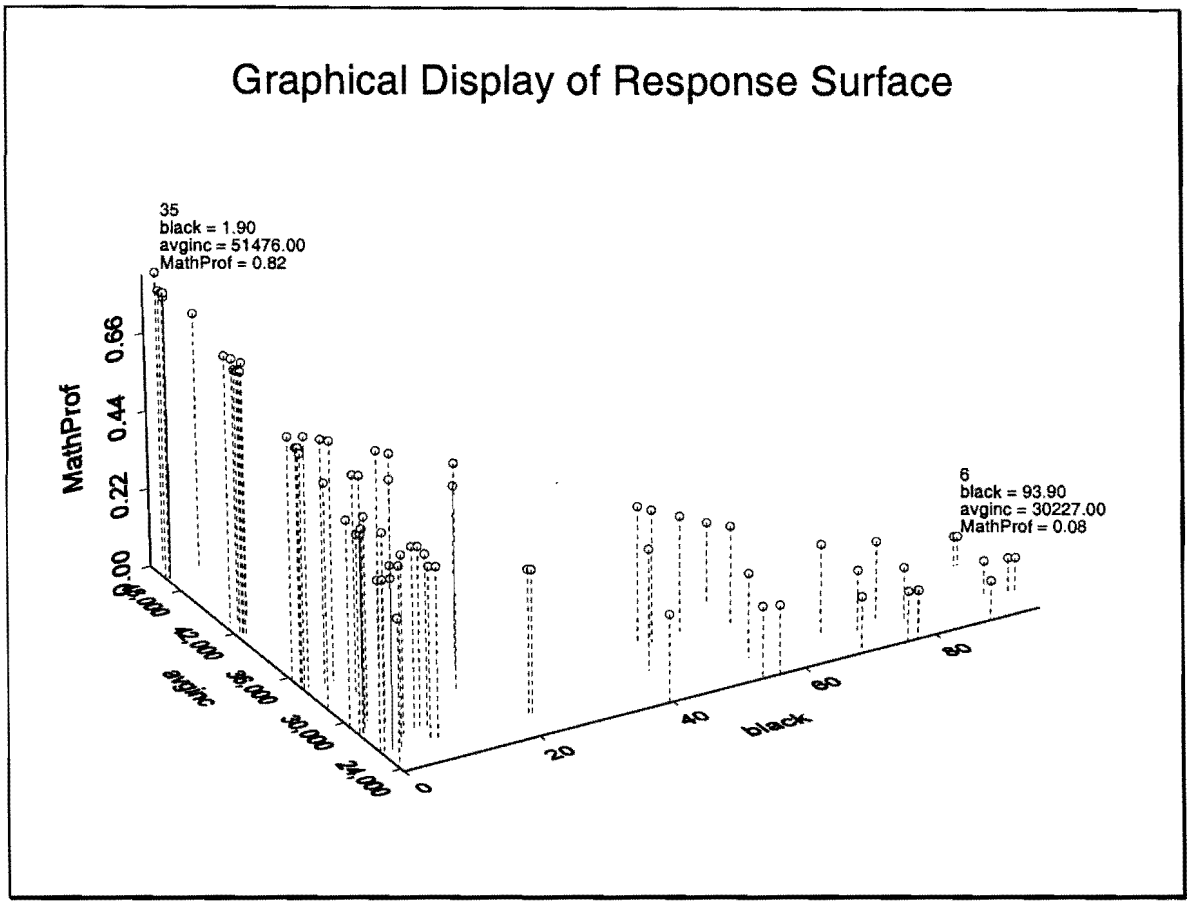
The third observation we can make about this model comes from Table 21, seen below. This table reveals the relative importance of each of the three factors—race (Black), poverty (ADC), and socioeconomic status (AvgInc). Similar to the results in the school-level regression tree, race appears here as the most important factor; it is significant at the .0001 level. While average income appears here to be more important than ADC, in reality, because race has already explained most of the variation ADC would have, there is little variation left for ADC to explain and so it appears less important than income.

Table 21: Response Surface Analysis-II

Regression	DF	Type I Sum of Squares	R-Square	F Value	Pr > F
Black	4	23.121778	5.780444	10.35	< .0001
ADC	4	1.132585	0.283146	0.51	0.7308
AvgInc	4	7.437430	1.859357	3.33	0.0152

Finally, the information provided in the response surface analysis can be summarized with a graphical display of the response surface, as seen in Figure 7 below. In this display, the two most important variables according to our findings in Table 21, race and average income, are graphed against predicted math proficiency score. Looking at the average income axis, we can see that, as math scores decrease, so does income.

Figure 7



And, looking at the axis representing the percent of students who are black, we can see that, as the percent of students who are black increases, test scores decrease.

In addition, this displays tells us how well the model is predicting the data, given income and race. Point 35 represents Central Elementary School in Sylvania, a school that is 1.9% black and has an average family income of $51,476. This model predicts that 82% of Central's students will pass the math portion of the sixth grade proficiency test; in actuality, 74.3% of students pass, so the model is fairly close in predicting math scores. Point 6 represents Losantiville Elementary School in inner city Cincinnati, where

93.9% of the students are black and the average family income is $30,227. This model predicts that 8% of Losantiville's students will pass; in actuality, 8.5% pass, so this model is very closely predicting the scores of the lower-income, highly segregated schools. Again, it is telling us that if the only two facts we about a given school are the percent of students who are black and average family income, we can still predict that school's scores closely without knowing any other facts about that school.

IV. Summary, Conclusions, Limitations, and Recommendations

Summary

This study was designed to compare high-achieving and low-achieving school districts/schools in Ohio. The goal of the study was to determine if there were any variables (spending, home background, teacher quality, school building condition, or efficiency) that distinguished the high-achievers from the low-achievers. These variables were included based on expectations developed from a review of related literature.

School districts were classified by the Ohio Department of Education into eight groups based on the type of town, amount of poverty, and degree of socioeconomic status associated with the district. I examined six of these eight groups by comparing medians within and between groups and analyzing regression trees. Schools within these groups were further classified into three groups—inner city, average city, and suburb. They were then examined by comparing medians, analyzing regression trees, and looking at the response surface. The major conclusions of this study are listed in the next section.

Conclusions

The conclusions flowing from the analysis of the data are discussed here in the order they were originally presented.

1. Spending per pupil cannot entirely explain achievement. In fact, high spending is often correlated with low-achieving districts/schools. Simply put, pouring money into these low-achieving districts/schools may not be the answer.
2. Home background variables largely explain differences in achievement. Districts/schools that serve students with high concentrations of poverty, with low socioeconomic status, and with high proportions of black students will be

characterized by low achievement. At the district level, ADC appears as the most important variable; at the school level, the percent of students who are black is most important.

3. The results concerning teacher quality variables were mixed. At the district level, there were no dramatic differences concerning teacher experience, advanced education, or classroom size, although, surprisingly, advanced education explained the most variation in test scores. At the school level, however, the two most significant differences appeared when considering teacher experience. In schools with high amounts of poverty, those schools with the most experienced teachers perform significantly better than those with the more inexperienced teachers. This may be due to the fact that teachers with a certain number of years of experience can choose which schools within a district they would prefer to teach at. Not surprisingly, they gravitate to the best schools, leaving the students in the low-achieving schools behind.
4. The results concerning the condition of school buildings were also mixed. At the district level, the results clearly indicated that poor building conditions were not exclusively associated with the low-achieving districts. However, the school-level data indicated that poor building conditions were associated with the lower-achieving schools. Clearly, this area requires further research.
5. Finally, the results concerning efficiency revealed two conclusions. First, districts serving poor minority students (Group 6 districts), as well as individual schools within Group 6, spent more on administration than other higher-achieving districts. Second, both the district-level and school-level data showed that high teacher salaries,

often the major component of instructional expenditures, were associated with the higher-achieving districts.

Limitations

In this section, I will describe both the limitations of the data used in this study and the limitations of my study in general.

Limitations of the Data

The limitations of the data used in this study result from the measure of student achievement—proficiency test scores—that was used. Just as the state is holding schools more accountable for test scores, the credibility of these tests is crumbling; last year, the Ohio Education Association, the largest teachers union in the state, called for a moratorium on the tests. The question is, how reliable are test scores in predicting a student's academic ability?

First, there are practical issues concerning the tests. This past February, it was revealed that Ohio hires a North Carolina company that pays temporary workers $8.50 an hour to grade 30-35 essays each hour (Ohlemacher, 2000). While these concerns relate only to Ohio's tests, though, tests are criticized on a nationwide basis for a variety of reasons.

First, a major problem with the tests may be that the scores often tell us more about what schools are teaching students than what quality of students they are producing. One major strategy used by the Pickerington School District, one of only four effective school districts in central Ohio, is to match curriculum with what is on the proficiency tests. The previous years' tests are analyzed by curriculum coordinators, who then put what is being tested into the curriculum, so that what is being taught in the

schools is carefully aligned with these tests (Bailey, 2000). The students are taught to the test, and one of the results is that these students' test scores are very high.

One researcher, Linda Darling Hammond, compares this strategy to a hospital whose administrators decide standards must be raised. Now, the patients must have their temperatures taken on a regular basis. Before the temperatures are taken, doctors give all the patients large doses of aspirin and cold drinks, so all the patients' temperatures appear normal, and the hospital's doctors are commended for taking great care of their patients. Still, despite this temporary fix, the patients are just as sick as ever. Likewise, when schools teach to the test, "only test scores, and not schools themselves, will improve" (Kohn, 1999, p. 67).

That proficiency test scores often reflect how well students are taught to a test is evident when new tests are introduced. Often, when these new tests are first given, students do poorly, and the headlines pronounce that students are failing. However, after a few years, these scores begin to rise as teachers adapt their curriculum and their teaching to the test, and headlines proclaim that schools are showing great improvement (Kohn, 1999). This example relates well to the science section of the Ohio proficiency test, which students currently pass at a very low rate. Inevitably, though, as Ohio teachers get used to teaching to this test, over time, scores will go up. Will this reflect the fact that students know more about science—and are better achievers—or simply that they know more about the type of questions they will be asked?

Even accepting the fact that the proficiency test reflects to a large extent how well a student has been prepared for the test, further questions can be raised as to how well the test measures a student's ability. For example, a recent study conducted by the Ohio

Department of Education shows that teachers' evaluations of students often deviate from those students' proficiency test scores. This study focused on fourth graders' reading scores. The students' fourth grade teachers were asked during the spring to predict whether students would pass the reading section; almost one-third of students teachers said would pass actually failed ("Reading Meaning," 2000).

The final problem with proficiency test scores is borne out by the results of this study. Alfie Kohn writes,

> [I]t is an open secret among educators that much of what the scores are indicating is just the socioeconomic status of the students who take them. One educator suggests we should save everyone a lot of time and money by eliminating standardized tests, since we could get the same results by asking a single question: "How much money does your mom make? . . . OK, you're on the bottom" [1999, p. 76].

While proficiency scores were designed to hold schools accountable for students' performance, clearly, these tests instead are holding schools responsible for factors beyond their control. However, despite these shortcomings associated with proficiency tests, they remain the only quantitative measure of student achievement, so, like other researchers, I have used them when comparing school districts and schools.

Limitations of Study (What I Have Learned)

Two lessons I learned about research over the course of my study of Ohio's schools include the focus that is necessary when designing the purpose of the study and the careful design that is required when writing survey questions. First, when I began this study, I knew little about schools beyond what I had read in Savage Inequalities and experience through my own schooling and my tutoring experience at a Columbus Public middle school. Therefore, I was eager to learn everything about Ohio's schools that I could and was hesitant to limit my study in any way. While I am pleased with the results of my study, I can now see what the benefits of a more focused study would have been.

For example, within the Cincinnati Public School District that was studied, there was a great variation in sixth grade test scores, ranging from only 0.8% of students passing the math portion of the test to 69.7% passing. A more in-depth study could have revealed what accounts for these extreme variations in scores within the same district. Although I did not receive a reply from the district with the lowest pass rate, I did receive a reply from the district with the highest pass rate, indicating that the school was alternative, which may or may not explain the variation (the question of alternative schools will be discussed in the next section). A more concentrated study could have probed these differences further, asking questions such as: What topics were stressed in each school's curriculum? What kind of teachers does each school employ—are they upper class, middle class, or lower class? What is the age of the textbooks? What is the age of the building? Is there a difference in community support of these schools? Because each school has its own culture, a culture that is difficult to quantify within the terms of a large-scale study like mine, the answers for these questions may provide interesting insights.

Second, I learned a great deal about the careful thought that is required when formulating questions for a survey. Two of the questions on my survey focused on each school's free lunch program. Using questions taken directly from a similar study conducted by the General Accounting Office (GAO), I expected to receive uniform answers, in particular to the question, "Around the first of October 1999, how many applicants in this school were approved for the National School Lunch Program?" However, this question prompted a variety of answers, including the quantity of students in the program (the answer I anticipated), the percent of students who had been approved

for the program of those who had applied, or the percent of the entire student population receiving free lunches. Although this question had to be excluded anyway due to the special circumstances surrounding the Dayton Public Schools, clearly, the range of answers I received raises questions about whether the GAO received a similar range of answers, and, if so, how these answers were interpreted.

In addition, one of the questions I wrote myself was left open for interpretation by school principals. This question, "How much emphasis do you place on the state proficiency tests?" asked educators to rank this emphasis from 1 (Very low importance) to 5 (Very high importance). While I designed this question to gauge educators' own opinions and attitudes about the relevancy of the tests, given the current backlash, I found that most principals answered according to expectations placed on them by others, and, as a result, of the 76 responses, 55 ranked the test as very important, 19 as important, and only 2 as neutral. While replying with a "very important," however, some principals indicated their frustration with the tests. One principal notes that the tests are very important, but only "due to pressure from the media and Education Department"; another writes, "[W]e place a great deal of emphasis on this—but do not trust the validity of these tests." Another principal, while checking that these tests are very important, simply adds the word "unfortunately!!!" So while my question was designed to elicit reactions to the tests, other than remarks from a few opinionated principals, I mostly received answers based on expectations placed on principals.

Recommendations for Education Decision Makers

Currently, Ohio is primarily focusing on two approaches to overcome its academic shortcomings: stricter accountability and school choice programs. First, Ohio

is putting stricter requirements on schools to improve test scores. Based on how schools perform on 27 standards, 25 of which are related to proficiency test scores, schools can be rated as being "effective," as having "continuous improvement," as being on "academic watch," or, worst of all, being on "academic emergency." Schools on academic emergency or academic watch must file detailed plans with the Department of Education about how they plan to meet the standards over the next three years; these plans must be given state approval. Schools then have three to five years to move up each level; if the academic emergency schools do not rate as effective within 13 years, they can be shut down (Stenberg, 2000b).

Obviously, given the results of this study and countless others, the state's approach here is puzzling. If a student's performance is beyond the control of the school—but is instead determined by home background—why are we holding schools accountable for students' performance? Should these schools include in their plan the removal of all black, poor children? An example of the failure of such an approach can be seen in Jonathon Kozol's depiction of schools in Camden, New Jersey:

> She [Ruthie Green-Brown, principal of Camden High School] speaks of the insistence of the state on a curriculum designed around a battery of tests. The test-driven curriculum, she says, established at the prodding of the former governor, Tom Kean, "is, in a sense, a product of the back-to-basics pressures of the 1980s." The results, she says, are anything but reassuring. . . .
>
> The children have to pass three tests: in reading, math and writing skills, according to a ninth grade English teacher. "They take preliminary tests before they leave eighth grade," the teacher says. "Eighty percent are failed, because of what has not been done for them in elementary school. So they enter high school labeled 'failures.' Their entire ninth grade year becomes test preparation. No illusions about education as a good thing in itself. They take the state proficiency exams in April of the ninth grade year. If they fail, they do it again in tenth grade. If they fail again, it's all remediation in eleventh grade. They must pass these tests to graduate.
>
> "Already, in the ninth grade, kids are saying, 'If I have to do this all again, I'm leaving.' The highest dropout rate is in those first two years."

> She shows me the curriculum for ninth grade writing skills: "Work-A-Test Study Program." There is no literature—in fact, there are no books. The longest passage in the "Work-A-Text" is one short paragraph immediately followed by test questions.
>
> "The high school proficiency exam," another teacher says, "controls curriculum. It bores the children, but we have to do it or we get no money from the state."
>
> From September to May, she says, instruction is exclusively test preparation. "Then, if we are lucky, we have two months left in May and June to teach some subject matter. Eight months for tests. Two months, maybe, to enjoy some poetry or fiction.
>
> "The result of this regime is that the children who survive do slightly better on their tests, because that's all they study, while the failing kids give up and leave the school before they even make it to eleventh grade. The average scores look better, however, and the governor can point to this and tell the press that he is 'raising reading levels.' It isn't hard to do this if your children study nothing but the tests. What have they learned, however? They have learned that education is a brittle, abstract ritual to ready them for an examination. If they get to college they do not know how to think. They know how to pass the tests and this may get them into college, but if cannot keep them there. We see students going off to Rutgers every year. By the end of the first semester they are back in Camden. So we teach them failure. . . . " [1991, pp. 143-145].

Currently, Ohio schools are facing the same dilemma as Camden's, as test-driven curriculum may actually harm students in the long-run.

While, given what we know about proficiency tests, Ohio's system of increased accountability seems problematic, another more promising avenue the state is proposing is school choice programs. Currently, the school choice movement is gaining momentum. More than 95% of Americans believe they should have more choice in their child's education, 40% of parents currently sending children to public schools would instead send their children to private schools if given vouchers (public funds that can be used by the family to send their child to any school they choose), and 80% of minority families in the inner cities favor vouchers. While proponents of school choice cite the opportunities vouchers give to inner city families to escape the schools in their neighborhoods, currently, there are only two publicly funded voucher systems in the

United States—one in Milwaukee, Wisconsin and the other in Cleveland, Ohio (Metcalf and Tait, 1999).

The Milwaukee Parental Choice Program was begun in 1990. During the '98-'99 school year, it enrolled 6000 students in 86 schools. Researcher John Witte was hired by the state to study the results of the program. He found that poor, single parent families were successfully recruited into the program. However, he also found that student achievement in the fourth year of the program, after controlling for prior achievement and home background characteristics, was not significantly higher (the voucher students performed slightly better than public school students on reading tests and worse on math tests) (Metcalf and Tait, 1999).

The Cleveland Scholarship and Tutoring Grant Program was begun in 1996[1]. It enrolled 4000 students at 44 schools during the '97-'98 school year. Again, students from poor, minority groups were successfully recruited into the program. However, there were also no significant differences in third grade achievement between the voucher students and public school students after controlling for prior achievement and home background characteristics (Metcalf and Tait, 1999). The effects of voucher programs, then, are not clear.

So while the state of Ohio's plan for student achievement can be questioned, the program in another state has brought great success. That state's school funding system, like Ohio's, was declared inequitable. However, unlike Ohio, its reform is being hailed as "the premier role model for education reformers nationwide" (Oplinger and Willard,

[1] This program has been declared unconstitutional by the U.S. Supreme Court because public funding is being provided to students to attend private schools with religious affiliation, thereby violating the separation between church and state. However, the program continues pending an appeal (Vosburgh, 2000).

1996b, p. 2). The state: our neighbors across the Ohio River, Kentucky. Kentucky's success has been most dramatic in elementary schools, as gains in high school students' test scores have been slower. Nonetheless, whereas Kentucky was once in the cesspool of states in terms of education, it now rides in the middle of the pack due, in part, to four initiatives: a new funding system, improved curriculum, teacher incentives, and strict accountability (Galuszka, 1997).

First, since the court ruling, Kentucky has increased educational expenditures by 60%. Sonny Fentress, superintendent of a poorer school district in Kentucky, says, "You're going to hear people say, 'Don't throw money at a problem.' But you can solve a lot of problems with money" (Oplinger and Willard, 1996b, p. 7). Fentress' school district has used its windfall to put cafeterias in three elementary schools, to build an $8.2 million high school, to begin an after-school tutoring program, and to buy computers. After this spending spree, Fentress' districts' test scores have improved the most of any district in Kentucky and now rank in the top ten districts. Unlike Ohio, where poor students are floundering, in Kentucky, poor students' test scores are comparable with rich students' scores (Oplinger and Willard, 1996b).

The second reform Kentucky has incorporated has been an overhaul of school curriculum. Spurning traditional teaching methods, Kentucky has instead embraced alternative teaching methods. Peter Galuszka describes a typical classroom in Kentucky: "There are no rows of little chairs or rigid drills at Ross Point, and descriptive assessments have replaced letter grades. The children, who elsewhere would be assigned to grades one through three, here share the same classroom. Older pupils help younger ones, and everyone learns at their own pace" (1997, p. 1). Students here are encouraged

to think critically, they are required to keep yearlong portfolios of their work, and they take no standardized tests but rather take tests where they must justify all answers in writing (Galuszka, 1997).

The third reform has been to link teacher performance with pay. If schools improve, teachers can earn bonuses worth up to $2300. By 1997, 53% of teachers had already collected such bonuses. The final reform, then, has been the increased accountability of teachers and schools. One superintendent says, "The test is supposed to drive pretty much everything" (Galuszka, 1997, p. 2). While Sonny Fentress is reaping the rewards of this system, as his district's test scores have increased dramatically, other educators are not so happy. One principal, Ronald Morgan, comments on how, despite having the highest test scores in the state, his school has been labeled an underachiever: "It's like bowling. If you bowl a 290, you can only improve your score by 10 pins. It ends up changing your whole curriculum because of the rewards and sanctions. You would be crazy not to teach to the tests" (Oplinger and Willard, 1996b, p. 5).

Another educator, superintendent Robert Wynkoop concurs, "I really like and support [the reform]. There are tremendous changes for the better in Kentucky. I think the instructional component was absolutely superb. The testing portion of what we're doing is another matter" (Oplinger and Willard, 1996b, pp. 5-6). So while Kentucky's reforms have been lauded for the most part, like Ohio, the state has drawn some ire from educators, at least, for its testing procedures.

Still, Kentucky's system has been a great success. The question is, can Ohio build on Kentucky's model and achieve this same success? To some degree, the answer is yes. First, Ohio can follow Kentucky's example and devote more resources to

instruction. While, in my study, I found that achievement was not related to spending—in fact, the low-achievers typically outspent the high-achievers—I posited four explanations, one of which was that low-achieving districts serve a higher proportion of disabled and disadvantaged students. Unlike Ohio, Kentucky has a funding structure to cope with such differences in student populations. While Kentucky, like Ohio, guarantees a minimum amount of funding to each school, Kentucky includes in this amount special costs associated with educating the poor and handicapped (Oplinger and Willard, 1996b). A similar idea should be incorporated into Ohio's funding structure.

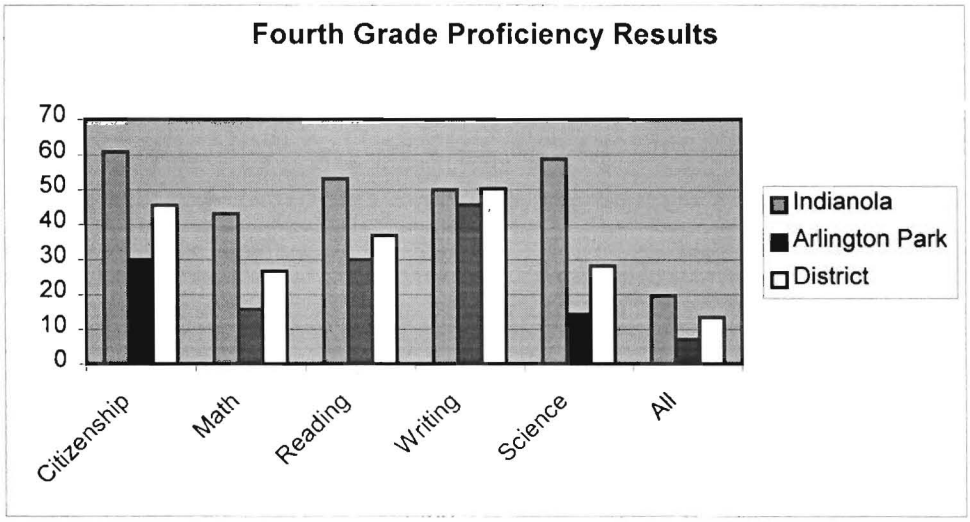
Second, the state is bent on pouring more money into the schools, but the Kentucky example shows that money alone is not the answer, as the state overhauled its entire curriculum. Two schools in central Ohio can serve as examples of how curriculum can be altered from the traditional model to increase student achievement. The first is Indianola Alternative Elementary School, which is similar to the Kentucky example. Here, grade levels are merged, students are encouraged to keep portfolios of their work, and critical thinking is emphasized.

Another example is Arlington Park Elementary School, whose teaching philosophy is on the opposite spectrum of Indianola's. This school incorporates a method known as direct instruction, under which "teachers follow a script that tells them what to say and when to say it. Memorization is a key element. Children recite answers in chorus, usually at the snap of the teacher's fingers or a clap of the hands" (Alford, 1999, p. 2). At this school, where 90% of students are below the poverty line, school performance has increased substantially (Alford, 1998). In 1994, the school ranked 80th out of 92 Columbus schools on the Metropolitan Achievement Tests. After two years in

which the direct instruction method was used, Arlington Park shot up to 15th (Alford, 1999).

The question for Ohio's policymakers is, which approach is better—that of Indianola or that or Arlington Park? As six more Columbus schools will be using direct instruction next year, the answer, in the minds of Columbus school officials, is clear. However, the test scores of these two schools, given in Figure 8, show surprising results.

Figure 8



As we can see, Indianola Alternative, not Arlington Park, is producing the best test results. In fact, Arlington Park students are below the Columbus School District averages on all portions of the test, while Indianola's scores meet or exceed district averages on all portions. Clearly, although alternative schools such as Indianola or those in Kentucky stress authentic learning—that is, learning for the sake of learning as opposed to passing a proficiency test—test scores in these schools have not suffered.

Finally, although Ohio has followed Kentucky's example in implementing pay-for-performance for some teachers and enforcing stricter accountability, Ohio has not

implemented programs to ensure student success. In other words, Ohio has raised schools standards without taking steps to improve schools themselves. In Kentucky, the tests do not reflect just a student's socioeconomic status, so it is fair to hold teachers and schools accountable for student performance. However, until Ohio's tests reflect something other than a student's home background, holding teachers and schools responsible for what is beyond their control is nonsensical.

Further, Ohio has greater issues to deal with than Kentucky—namely, its inner city schools confront problems not only with poverty, but also with segregation. As noted in the review of related literature, decades of research have shown that desegregation improves black students' test scores without hurting white students. In addition to considering increased desegregation, Ohio should consider two of the factors that hurt low socioeconomic students the most—hidden curriculum and tracking. First, the hidden curriculum is one that teaches upper-class white students that they are valued most, because their culture is emphasized most in schools. As a result, minority, low socioeconomic students may rebel against a school that holds their culture in low esteem. Two ways schools can combat this hidden curriculum are to use textbooks that incorporate multi-culturalism and to actively recruit teachers from lower-class backgrounds, so that students have teachers from similar backgrounds with whom they can identify. A final recommendation here is to train guidance counselors to reduce discriminatory practices of tracking, or funneling lower-class students into vocational, or non-college, tracks.

Recommendations for Further Research

There are three important ways in which further research can be conducted, using this study as a basis. First, new variables not studied here can be developed and investigated. For example, in this study, home background variables were found to be of high importance. However, race, socioeconomic status, and income are not these only factors related to home background. A particularly interesting factor that can be studied is family background, including family expectations and family education. Another interesting variable to study might be community support, including how active communities are in establishing programs like after-school tutoring and how many levies that have been passed or defeated. Finally, cost-of-living differentials between districts can be studied. For example, a different relationship between spending and student achievement may be discovered if spending is adjusted for cost of living indexes within each district.

Second, variables studied here can be examined in more depth to reduce ambiguities in some of the findings. For example, the district-level data and school-level data were contradictory, in that the district-level data uncovered no relationship between building condition and achievement, and the school-level data found that poor building conditions were associated with the lower-performing schools. Given the amount of money Ohio is planning to invest in improving school building conditions, a study devoted entirely to deciphering a relationship between building conditions and achievement could be informative in deciding future policies. Another ambiguity in the results appeared when I examined the relationship between advanced education and student achievement. While the district-level data seemed to support the idea that

advanced education levels coincide with high student achievement, the school-level data found no relationship between the two variables. Because, in the future, Ohio's teachers will be required to have master's degrees to teach, further study here may be helpful in evaluating Ohio's policy concerning advanced education.

Third, some questions raised in this study can be addressed. The most important question raised concerns about the relevance of proficiency tests. One potential study could examine the relationship between the time a school devotes to preparing students for the proficiency tests and the school's test results. Another issue raised concerned the value of alternative instruction, such as that taught at Indianola Alternative Elementary School. Interesting research here might include a longitudinal, case study of students at both Indianola and Arlington Park to determine the long-term effects of non-traditional forms of teaching on student achievement.

Appendix A

Data used in this project was collected from the following sources:

The Ohio Department of Education

% of Ninth Graders Passing the Ninth Grade Proficiency Test as Ninth-Graders, 1994
% of Sixth Graders Passing the Math Portion of the Proficiency Test, 1997
Spending Per Pupil (District and School Level), 1985-1994 and 1997
Total ADM, 1994
% ADC, 1994 and 1997
Family Income, 1994 and 1997
% of Students who are Black, 1994 and 1997
Teachers' Average Years of Experience (District and School Level), 1994 and 1997
% of Teachers with Master's Degrees (District and School Level), 1994 and 1997
School Enrollment, 1997
Superintendent Salary, 1994
Total Spent on Officials/Total ADM, 1994
Teacher Salary (District and School), 1994 and 1997
Total Spent on Teachers/Total ADM, 1994
Total Spent on Clerical Workers/Total ADM, 1994
% of School Expenditures Spent on Instruction, 1997
% of School Expenditures Spent on Administration, 1997
% of School Expenditures Spent on Building Operations, 1997
Total ADM/Classroom Teacher, 1994

1990 Ohio Public School Facility Survey

Amounts Needed for Repairs, Rebuilding, and Additions, 1990

Survey

Classroom Size, 2000
Evaluation of School Building, 2000

Appendix B

Definition of Variables

Rural—very low density, high or moderate percentage agricultural property

Small town—low density, moderate percentage agriculture, some industrial economic base
Urban/Suburban—high density, little or no agricultural property, high industrial base

Major City—very high density, little or no agricultural property, high industrial base

High SES—typically very high (relative) income levels, high percentage of population with some college or more, high percentage of population employed in professional/administrative occupations

Low SES—typically low relative income levels, low percentage of population with some college or more, low percentage of population employed in professional/administrative occupation

ADC (Aid to Dependent Children)—assistance to single mothers and their children. While ADC has become a term synonymous with welfare, it actually represents less than 10% of public assistance. Typically, to be eligible for the program, single mothers must show that their total assets (excluding home equity) is less than $1,500. In 1988, 55% of all recipients were blacks or Hispanics (Oliver and Shapiro, 1997).

Fall Enrollment (or Total ADM)—kindergarten through Grade 12 enrollment minus unauthorized attendance minus out of state enrollment plus non-attending pupils

Amounts Needed for Repair and Rebuilding—assessments made by area agricultural firms regarding repair and rebuilding needed concerning heating systems, roofing, ventilation/air conditioning, electrical systems, plumbing and fixtures, windows, foundation, walls and chimney, floor and roofs, general finish, interior lighting, security stems, emergency/egress lighting, fire alarm system, handicapped access, site conditions, sewage system, water supply, exterior doors, asbestos, life safety code, and soft cost. Because no distinction was made in the report between repair and rebuilding, they will be grouped together for the purpose of this study.

Amounts Needed for Additions—assessments made by area agricultural firms regarding the need for additions. The additions listed were those needed to serve existing students and made no prediction as to change in populations. Factors involved in the calculation included the amount of square footage requirements, the dollar amount per square foot for the relevant type of building, and the number of students to be housed.

School officials (used for the variable Total Spent on School Officials/Total ADM)—include superintendents, assistant superintendents, principals, assistant principals, supervisors, managers, directors, and treasurers

Instruction (used for the variable of % of School Expenditures Spent on Instruction)—e.g., teacher salaries and classroom materials

Administration (used for the variable of % of School Expenditures Spent on Administration)—e.g., office salaries, supplies, and postage

Building Operations (used for the variable of % of School Expenditures Spent on Building Operations)—e.g., utilities and maintenance

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